



# **JOURNAL OF INDIAN RESEARCH**



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*Knowledge to Wisdom*

*Mewar University*

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## CHAIRPERSON'S MESSAGE

The Indian industrial sector has gone through various phases since independence. The major reforms in Indian Industrial sector were witnessed during the 1990s. For instance, in 1991, there was a gradual dismantling of industrial licensing, removal of import licensing from nearly all manufactured intermediate and capital goods, tariff reduction and relaxation of rules for foreign investment. The reforms in respect of the industrial sector were intended to free the sector from barriers to entry and from other restrictions to expansion, diversification and modification so as to improve the efficiency, productivity, and international competitiveness of the Indian industry.

Now India has emerged as the world's fastest-growing large economy, it's no surprise that demand for capital goods has more than doubled in the past decade. Yet one-third of this demand has been met by imports. India imported machinery worth more than \$30 billion in 2015, making it the fourth-largest import category after crude oil, electronics, and gold. For a little over \$2 trillion economy, the country's capital-goods sector remains relatively underdeveloped, offering a significant business opportunity for both Indian and foreign original-equipment manufacturers (OEMs).

India's domestic capital-goods industry is weighed down by low investment in technology and talent. Most companies focus on low-value-add fabrication and assembly work, unable to move up the chain with their designs or technology. Value addition represents only about 22 percent of total output, or \$13 billion, and the capital-goods sector as a whole accounts for just 0.6 percent of India's GDP, compared with 4.1 percent for China, 3.4 percent for Germany, and 2.8 percent for South Korea (exhibit). The output of domestic capital-goods players grew by an average of 2 percent annually from 2010 to 2015, trailing the overall average of 7 percent annual economic growth.

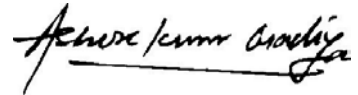
India's liberalization in 1991 was premised on the idea that it would make local industries more competitive, helping them capture world markets, which in turn would enable millions of Indian workers to move away from low-productivity farm jobs to high-productivity factory jobs.

India's economy consists largely of small firms, a large segment of them in the unorganized sector. This creates several hurdles to productivity and economic growth. Enterprises are unable to invest in the machinery needed to boost labour productivity due to a lack of access to capital. They are also unable to invest in worker skilling. The low productivity and output consequently result in poor wages. Technological diffusion to the rest of the economy tends to be uneven and slow. The preponderance of small enterprises in the Indian economic landscape thus works against the introduction, use and spread of labour productivity-boosting innovation.

The goods and services tax is an important step toward formalization of the economy, but the resultant productivity boosts will take years to gestate. Meanwhile, labour law reforms are still pending. In their absence, formal enterprises lean on contractual workers. This robs them of efficiency gains and the economy of the benefits of a productivity boost. Little wonder

India's automobile industry—one of the flag-bearers of the post-1980 manufacturing surge—still suffers from a substantial productivity gap that reverberates down the supply chain to smaller enterprises. And while the government's skilling efforts at least acknowledge a serious labour capital problem, their failure thus far points to the importance of organic, private sector efforts that are difficult to come by in an economy as structurally lopsided as India's.

India's expenditure on R&D as a percentage of GDP has remained stagnant at 0.6 to 0.7 of GDP, however GDP has increased and so has the sum spent on R&D. Greater spending on R&D leads to innovation. Such innovation is visible among a handful of private Indian companies who are innovating in the personal protective equipment (PPE) space. Such innovation includes manufacturing PPE that meets the newest European Norms (EN).



**Dr. Ashok Kumar Gadiya**

## EDITORIAL

Human civilization is at the cusp of gigantic transformation. Humans were the first living organism that developed the power of self-consciousness. It is this self-awareness that gave the much needed “intelligence”. Our sapience emerged from a carbon pathway. The genetic material is built upon carbon molecules and so does our physical body which is basically a lump of carbon-based organic compound.

Our urge to develop the surrounding environment led to the building of complex societies, technology and civilization. In last two hundred years, the modern industrial civilization sprang up giving us immense advantage over all other biotic communities. In last few decades, the attempt to imbue machines with intelligence has led first to IT revolution and now the upcoming race to build AI-systems. The machine intelligence is byproduct of silicon pathway as it is the silicon chips that process the calculations. It is now agreed that intelligence is not singularized in carbon pathway. Apart from genetic materials that code different aspects of intelligence, there are elements in nature which can spur intelligence bypassing the slow and prolonged biological evolution.

Till now, both carbon and silicon pathways are basically based upon elements with four electrons in the last orbit. While configuration of electrons in carbon (atomic number=6) orbit is 2,6; configuration of electrons in silicon( atomic number =14) orbit is 2,8,4. Germanium (atomic number=32) has similar configurations of electrons in orbit (2, 8, 18,4). Germanium has about three times the electron mobility of silicon. This may be useful in, building faster transistor switching times. In year 2014, a team of scientists at Purdue University has created the first modern germanium circuit in 2014. Possibility of new pathways of intelligence is wide-opened.

Today, when several exo-planets are being located in our galaxy, we feel more certain that there may be other-than-human life-forms with sapience. But would the life-forms be based upon only carbon pathway? In all likelihood, when we might face aliens from exo-planets in next century, these are certainly going to be based upon newer pathway of intelligence. Are they going to be friendly? Are we going to biotically mix with them and producing new hybrids with insurmountable intelligence?

Nature has canny way to incite our urge to explore. Mankind has started exploring gene editing technology. Few weeks ago, a Chinese scientist He Jiankui announced how he edited the genes of twin sisters, Nana and Lulu in an attempt to protect them from infection with the HIV virus inherited from their father. Jiankui is an Associate Professor at the Southern University of Science & Technology( SUST) in Shenzhen. The global community is still in shock and debate on bioethics is raging across the western world.

The journey from decoding the genome sequence to gene editing has been relatively short. In July 1995, the first genome sequence of a living organism, the bacterium *Haemophilus influenza* with 1,830,137 base pairs was reported. The Human Genome Project (HGP) was officially launched by the US government in 1990, and was declared complete in 2003. The completion of the Human Genome project meant that scientists had catalogued every nucleotide letter in the 3 billion letter-long human genetic code. This has made possible the advent of genetic editing under which scientists can delete, add or change specific bases at

designated locus. Genetically modified organism (GMO) or transgenic organism that contains a gene from a different organism with specific traits is now regularly developed for plants and animals. In November 2017 for the first time ever, scientists edited a patient's DNA while it was still inside his body. It was an effort to cure a genetic disorder, and the scientists attempted to do so by permanently changing the patient's genome.

Gene editing can also make possible insertion of artificial and synthetic chromosomes. Increased knowledge of biological processes and advanced molecular-biology tools will also make possible the insertion of complete and novel biochemical pathways and processes. Possibility of artificial or synthetic chromosomes and genomes that might allow the assembly of a large number of genes in a self-replicating molecule is under consideration.

A team of engineers in Korea's Advanced Institute of Science and Technology (KAIST) are working on creating Robot genes and Genetic Robots. This is the new enterprising field of Robot Genetics. Here, an algorithm based synthetic DNA is created after gene mapping of human genome and inserted into mobile robots. The concept is in advanced stage and under development by South Korean team under Jong-Hwan Kim. Scientists are attempting to build an artificial creature that would be capable of human-style evolution.

South Korean team used Rity, an artificial creature, to test the world's first robotic chromosomes—a set of computerized DNA codes for creating artificial creatures that can have their own personality, and can ultimately reproduce their own kind or even evolve as a distinct species. The effectiveness of the Korean team's artificial chromosomes was demonstrated by implanting genetic code into two Rity robots living in a virtual world, in order to specify their personality. In 2007, the Korean team applied for a patent for their "genetic robot" invention. This might lead to origin and evolution of artificial species.

The future world would be an unpredictable world of chimera and hybrids. With synthetic bio-forms, gene editing and fusion of robotics, artificial intelligence and genetic engineering; the world would be filled up with chimerical organisms about whose behaviour, nothing can be predicted. The society would be disrupted and autonomous bioforms with higher intelligence powerful than that of humans might reduce us to the position of being the last natural intelligent beings.

But, spurt in such technology and creation of new bioforms would only be a precursor to the encounter with the unknown aliens from exo-planets. With such technology in advanced stage, it would be possible to mix the different pathways of intelligence along with synthetic pathway and through gene editing; humans can learn to breed with other extra-terrestrial biotic communities.

Until and unless we start preparing students for tomorrow, we would be confined to historical world where proponents and followers of mythography and historiography would merely be reduced unto the underprivileged ones prone to control and manipulation of higher intelligent beings. The bandwagon of puritans no longer can control their destiny if they do not learn to undertake great mixing of ideas at this critical juncture.

**Niraj Kumar**  
Honorary Editor



# OBOR DIPLOMACY AND ITS IMPACT ON INDIA-CHINA BILATERAL RELATIONSHIP

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## ABSTRACT

*In past few years China-India relationship has been on upward trajectory given the high-level engagement from both sides. Both countries are in transition period and are required to complement each other in developmental projects. In last three years, both countries have witnessed change and a new momentum in their bilateral as well as multilateral engagement. In this context, China's One Belt One Road (OBOR) initiative has become a new arena for neighborhood diplomacy. This new aspect of diplomacy between India and China has immense significance for Sino-India bilateral relationship.*

**Keywords:** Diplomacy, India-China Relationship, OBOR.

## INTRODUCTION

Twenty first century is very vital for Asian community as also for the rest of the world. At the end of the 20th century, people were talking about the resurgence of East Asia namely four East Asian dragons- China, Korea, Japan and Singapore. South Asia has more or less become a talking point at the advent of the 21st century with the emergence of India as an economic power-house. Rightly predicted, India has now emerged as the third largest economy (GDP based on purchasing-power-parity) and a key player in Asian geo-politics. Relation of India with foreign powers has also become a hot topic among the strategists and political pundits. China has been the most important element in India's foreign policy and has been dealt with utmost care and diligence. China at the dawn of this century had also started paying more attention on India given its size and role it plays in South Asia, Asia Pacific and the Indian Ocean. Under the fast changing geo-political landscape of Asia and the world, India and China are destined to come together or confront each other on several geo-political issue. China's *One Belt One Road* (OBOR) initiative is one such issue that is being seen as an issue that India

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should confront or cooperate according to its own profit-loss assessment. In this paper we are giving a brief account of India-China OBOR diplomacy and its role and impact on India-China relationship.

On September 7, 2013 Chinese President Xi Jinping announced the New Silk Road Economic Belt Initiative while delivering a speech at Nazerbayev University in Kazakhstan. Chinese President Xi proposed that China and Central Asian Countries should enhance communication and cooperate in formulating policy and law for regional economic integration. Xi also proposed that China and all Asian countries should work together to enhance traffic connectivity from the Pacific Ocean to the Baltic Sea and further move for the greater integration of East, West and South Asia through a network of transportations.<sup>1</sup> On October 3, 2013, while visiting Southeast Asian countries, Chinese President Xi Jinping announced his plans to launch the 21st Century Maritime Silk Road while addressing Indonesian Parliament. Xi Jinping was the first Chinese President to address Indonesian Parliament and he proposed to upgrade the relationship between China and Indonesia to comprehensive strategic partnership. China states that 21<sup>st</sup> century Maritime Silk Road is based on the old Maritime Silk Road that was initiated during Ming Dynasty (1368-1644) by Admiral Zheng He (1371-1433) some six hundred years ago. Zheng He took seven voyages through South China Sea to the Indian Ocean passing through many countries that now lie in the ASEAN region. While proposing to jointly build the 21<sup>st</sup> century Maritime Silk Road, China aspires for creating a platform for more opportunity with a shared destiny among China and ASEAN.<sup>2</sup> Chinese State Council's Premier Li Keqiang at the 10th China-ASEAN Expo in 2013, emphasized to build Maritime Silk Road to promote hinterland development in China and in ASEAN region.<sup>3</sup> In November 2013, the Third Plenary Session of the 18th Central Committee of the Communist Party of China adopted Belt and Road initiative and called for accelerating infrastructure links among neighboring countries and facilitating the Belt and Road initiative. In December 2013, President Xi Jinping while addressing Annual Central Economic Work Conference urged strategic planning of the Belt and Road initiative to promote connectedness of infrastructure and building a community of common interests.

Throughout the year 2013 saw a series of announcement from China in their neighborhood diplomacy. The most prominent announcement that directly affected China-India relationship is the announcement of China's intention to invest in China-Pakistan Economic Corridor (CPEC) which passes through disputed region between India and Pakistan. China-Pakistan Economic Corridor which was conceived formally by former Pakistani President Pervez Musharraf but later postponed due to internal turmoil in Pakistan. It was only in May 2013 when the then Pakistani President Asif Ali Zardari proposed to build China-Pakistan Economic Corridor to Premier Li Keqiang during latter's State visit to Pakistan, and both sides agreed to materialize this project. Here important point is Premier Li Keqiang went on State visit to Pakistan directly from India, and while in India, China didn't hint at his intention to invest in CPEC where India has reasonable objection. While in India, India-China agreed to build Bangladesh-China-India-Myanmar Economic Corridor (BCIM EC) which was formally announced for the first time in the Joint Communiqué between India and China. China did know that if they raise their intention of investing in the disputed region of China-Pakistan Economic Corridor then India

might not agree to even collaborate on BCIM EC, so they choose to be silent on this matter and got India's agreement for BCIM EC. This diplomatic maneuver might have influenced India's stand on China's One Belt One Road initiative.

First half of the year 2014 had not seen a very high-profile OBOR diplomacy between India and China because the incumbent Indian government was about to complete its tenure in Centre and were preparing for general election. Knowing the political uncertainties that may prevail after general election in India, China opted to extend invitation to India to join OBOR initiative while UPA was in government, although lame-duck. This might be because new Chinese government found outgoing UPA government more cooperative to China and the incumbent Indian National Security Advisor Shiv Shankar Menon had a good rapport with the Chinese Special Representative Yang Jiechi. Knowing the uncertainty that might arise with the new Indian Government and the positive environment that was built between India and China with the Chinese Premier Li Keqiang's visit to India in May 2013 and Indian Prime Minister Manmohan Singh's visit to China in October 2013, China didn't want to miss the opportunity of the 17th round of Special Representative meeting between Shiv Shankar Menon and Yang Jiechi to extend invitation to India to join the initiative. This was the first formal invitation to India to join Chinese Initiative of OBOR after formally announcing it some five months before. It is said that India's National Security Advisor and Special Representative Shiv Shankar Menon had agreed to cooperate on Chinese initiative but then the UPA government had never expressed its opinion on the Chinese invitation in public. This can be understandable because tenure of the then UPA government was about to end and they might have thought to leave such policy issue for the upcoming government to handle. Even government didn't mention it in their official records of the 17th round of meeting between the Special Representatives on the website of Ministry of External Affairs. This speaks volume about India's reservation about the initiative although not pronounced in public then.

It was in February, 2014 when the then Pakistani President Mamnoon Hussain visited China to attend second meeting of Joint Cooperation Committee (JCC) on China-Pakistan Economic Corridor being held in Beijing. The participation of State head made it clear that China-Pakistan were paying utmost importance to the execution of the economic corridor plan.<sup>4</sup>

In March 2014, Premier Li Keqiang while presenting government work report called for accelerating Belt and Road construction and a balanced development of the Bangladesh-China-India-Myanmar Economic Corridor and the China-Pakistan Economic Corridor.<sup>5</sup>

In May 2014, the first phase of a logistics terminal jointly built by China and Kazakhstan went into operation in the port of Lianyungang in east China's Jiangsu province and it was reported that Indian business community is also using this port to freight Indian goods to Central Asia. This may be a very important event as Indian business community had been looking for alternative route to ferry their goods to Central Asia and Russia through sea based cargo. China had just provided that alternative to Indian business community at an affordable price that is worth considering for India of its participation in the initiative.

In the meantime, India had elected a new BJP-led government at the Centre and Narendra Modi took oath of Prime Minister of India on 26th May, 2014. With a new government at helm,

Indian foreign policy had also seen a new energy in their approach to neighborhood countries. Just before the diplomatic exchange with the new government at New Delhi, Indian Foreign Secretary Sujata Singh had led sixth Round of Strategic Dialogue between China and India at Beijing and it was reported that Indian side had expressed their unhappiness with the Chinese investment in disputed territory in Pakistan-occupied Kashmir. It became formal protest when Indian Vice-president Hamid Ansari paid a State-visit to China to commemorate 60th anniversary of *Panchsheel* (Five Principle of peaceful coexistence) in June, 2014. It was also the first official high level meeting between India and China after new government took oath in New Delhi. It was reported that China again raised issue of Chinese initiative of OBOR and invited India to join, but in the official records on the website of Ministry of Foreign Affairs of People's Republic of China had only mentioned BCIM EC. China also emphasized that "Both sides should make their own development strategies converge, strengthen exchanges of experience in governance and administration of state affairs, tap cooperation potentials, and promote the construction of the Bangladesh-China-India-Myanmar economic corridor to boost regional development ", as quoted at the ministry website.<sup>6</sup> Indian side had asked for more detail on the OBOR initiative for India to have a formal opinion on this Chinese offer. On July 14, 2014, Chinese President Xi Jinping and Indian Prime Minister Narendra Modi met for the first time on the sideline of BRICS summit in Fortaleza, Brazil. In this meeting, China welcomed India to join Asian Infrastructure Investment Bank (AIIB) as a founding member and reiterated the construction of the Bangladesh-China-India-Myanmar Economic Corridor for further regional economic integration.<sup>7</sup> On Sept. 17, 2014, Chinese President Xi Jinping arrived in India on a State visit. China and India had an extensive dialogue and China even promised to invest some \$ 20 billion in India. This was marked as huge successes for Indian diplomacy and cherished as a growing intimacy between India and China. India had long strived for bigger Chinese investment but the political rivalry and strategic concerns had created a number of bottlenecks for Chinese investment.

In May 2015, Indian Prime Minister Narendra Modi paid a State Visit to China and held extensive dialogue on various bilateral and multilateral issues. It is not clear if China had again raised the OBOR initiative with Prime Minister Modi. But Indian Foreign Secretary S. Jaishankar while addressing press conference in New Delhi on the eve of Prime Minister Narendra Modi visit to China-Mongolia and Korea on 13th May, 2015, said "It is their initiative, so I think it is not for us to welcome it or not welcome it. It is something which is there on the table. To the best of our knowledge we have not really had a detailed discussion on this subject".<sup>8</sup> On May 13, 2015, *The Telegraph*, Calcutta, reported that ex-Foreign Secretary Shyam Sharan said that "Don't close the door on it...Before taking a stand; we ought to engage the Chinese, understand what the components of the initiative are, and whether and how India can participate to its advantage. Conveying our concerns over those components of this project that violate our sovereignty must also be a key part of the engagement." From the statement, one can conclude that India didn't have an extensive dialogue on the initiative with China and whatever India had known through official or unofficial dialogue, India had expressed its reservation on the issue. In the meantime when China was pushing India to participate in the Initiative, India asked for China's support for NSG membership which China noted as reported by ministry website.<sup>9</sup>

On July 20, 2015, Indian Foreign Secretary S. Jaishankar delivered the 21st IISS Fullerton Lecture in Singapore. Topic was “*India, the United States and China*”. For the first time India had given an official detailed opinion on China’s OBOR initiative in public. He said that such initiative has been planned without having appropriate discussions with all the parties involved and so India couldn’t accept such national initiative. It was clear from his remark that India is not ready to participate in such unilateral Chinese initiative.

After the visit of Prime Minister Modi to China, both leaders have met on few multilateral fora and India had constantly raised two issues with China. One is support for India’s NSG bid and the second one is China’s decision to veto India’s move to ban Jaish-e-Muhamad leader under UN 1267 resolution. Since China’s decision not to support India’s bid for NSG and UN 1267 resolution, the warmth in relationship has seen sharp fall. China does understand this but wanted to convince India without reciprocating in other diplomatic need of India. Chinese intellectuals had repeatedly called for more pragmatic approach towards OBOR initiative from India and had even suggested much theoretical as well as technical solution for India’s concern over CPEC which passes through the Pakistan-occupied Kashmir. Now when China is still trying hard to persuade India to join the initiative, the bilateral relationship had seen some cold wave as is evident in recent unfolding of events. Overall year 2015 could be seen as a year of molding of Indian public opinion on the Chinese initiative and an important paradigm shift in India-China relationship. The modus vivendi that has been in place for decades between India and China for addressing concerns of each other seems to be dismantling and requires for a new approach to bring a positive energy in their relationship.

Year 2016 has seen a lukewarm relationship between India and China. Various thorny issues had become the point for disagreement and had cast on the warmth of relationship that had been sown by the new leadership in New Delhi and Beijing. As agreed by the both countries, they will keep the warmth in their relationship by arranging high-level State visit from both sides. In May 2016, President Pranab Mukherjee made a State visit to China. Again Indian Prime Minister Narendra Modi and Chinese President Xi Jinping met on the sidelines of the 8th BRICS Summit in Goa for their bilateral talks. In all these high-profile meetings, both sides tried to persuade each other to garner support for their own diplomatic move or project. But as was expected, neither India could gain any substantive support from China on NSG or terrorism nor China could gain India’s agreement to join the OBOR initiative. Year 2016, although saw an increased number of high-level exchange but couldn’t gain any substantive outcome on many bilateral issues and could be remembered as a year of fallback in India-China bilateral relationship.

### **CHINA IN NEED FOR INCLUSION OF INDIA IN ITS FLAGSHIP PROJECT *OBOR***

China’s OBOR project is probably the only major diplomatic move since the establishment of New China to project its influence in the neighborhood and push economic development in their hinterland. In China’s foreign policy priority, India probably now figure among top five entities viz. America, Russia, Japan, EU and India. The growing influence of India on global platform and its emergence as the biggest consumer market makes it inevitable for China to court India to make its initiative a success. It is a fact that India’s participation would be of huge significance for OBOR initiative as it will literally cover whole of Asian region. India’s

inclusion would also boost the global legitimacy for China- led such projects and will further enhance China's leadership on global stage. On any global initiative, China would be in need for India's support as she is not only China's largest neighbor but also the fastest growing economy at present which exert considerable amount of influence on global stage.

### **INDIAN EXPECTATION FROM CHINA**

What would be the impact of OBOR initiative on global structure might be of concern to Indian strategists. India needs a favorable environment for its own economic development. China's emergence as a global power may be complimentary for India's development as most of Chinese leaderships have reiterated time and again that China is an opportunity for India to boost her development through Chinese expertise and economic might. But India is still weighing how much she can be benefited through such initiative as Chinese investment will come even if India won't participate in OBOR. From India's perspective it may be true to some extent but If India decides to choose to participate, it would make her a stakeholder in China's economic policy and so would be benefited even more.

But then India must calculate what she needs to change in order to join this initiative. Whether it's India's foreign policy or its own diplomatic assets; all are required to be reoriented in order to make India fit into Chinese OBOR initiative. India then also has to pay the price in terms of its non-aligned foreign policy and sacrificing its Pakistan-oriented strategic thinking. Once India becomes a stakeholder in China's initiative, it would also get involved in Pakistan's internal and external dynamics. These entire new scenarios that might appear after India's agreement to join the initiative may be holding India back in their approach to the Initiative.

### **REASONS FOR LOW SUPPORT OF CHINESE INITIATIVES IN THE INDIAN PUBLIC SPHERE**

After a careful investigation of Indian public discourse on many national and international issues, we could get a sense of their perception on Sino-India relationship as well as many domestic and international issues. In this section we have summarized some reasons that may be playing behind the scene for India's decision not to be a part of the Initiative.

**Overtly negative perception of Sino-India relationship:** Sino-India relationship although had come out of Cold War mentality but lingering of coldness in some part still reflects at the psyche-level. Although both the country have shown remarkable improvement in their bilateral, multilateral, regional as well as interregional relationships. It may be noted that both nation have come out to set a term for cooperation but the internal dynamics for development of their own country led these two nations to compete at many levels. When both China and India were striving for faster rate of development, it is quite inevitable to have some rivalry. But these rivalries were projected overtly negative in media and in some section of academia. This had led to form a negative impression about the relationship in public discourse.

**Different priority for development agenda in both the country:** Both India and China have different priority for their own development goal. China's priority is much different from what India has set for. China has already reached a higher stage of development while India

is still striving for getting better. In this pretext, India fear of losing its developmental priority to the Chinese grand initiative. India really doesn't know how this initiative could be merged with her own developmental agenda. India, as many Indian scholars have frankly articulated, could get only marginal benefit from the initiative as the core idea of development is centered towards China. This narrative had made India unenthusiastic towards the initiative. India still hopes that China would offer something very substantive to India that fit for her own development goal.

**Geo-strategic factor at play:** India since independence has been pursuing a non-aligned movement in her foreign policy orientation. Even in Cold-War era, India had managed to not be seen in between US-Soviet Union rivalry. This policy guideline still manifests in India's foreign policy. When there is a growing talk about coming of US-China rivalry in near future, India won't like to see herself in between. This might have been a reason behind India's reluctance to be a part of such initiative.

### **FALLBACK IN INDIA-CHINA BILATERAL RELATIONSHIP**

Consensus has been the key for such transnational project that hugely is absent in this case. Since the inception till now, India had argued that China never tried to make a consensus with India on such project that the Chinese wants India to join, neither in case of China-Pakistan Economic Corridor nor in the case of Maritime Silk Road. At the government level they never discussed in detail nor have told how India should participate. They just want India to embrace such initiative without taking India in confidence or convincing India that this is going to be beneficial for India and help India realize her own developmental goals. It should be noted that when consensus is not being pursued, apprehensions and mutual distrust grows. In this case if both sides want to mitigate their concerns, consensus should be reached through extensive dialogue.

### **RESTRUCTURING SINO-INDIA DIALOGUE FOR A BETTER FUTURE**

**Dialogue Forum:** India-China has now a variety of dialogue fora. These fora must be extensively used to convey each other's opinion and mitigate the prejudices of others side. Such fora have been established in a variety of areas such as political parties dialogue forum, State-provincial ministerial dialogue forum, China-India economic and financial dialogue forum, media dialogue forum, Think-Tank forum etc. Although these fora have been meetings annually or biannually, these still have a lot of potentials to harness as many areas remain untouched. These forums must be channelized to harness the boundless potentials that India-China together have.

**Indian and Chinese Civil Society should engage in constructive dialogue:** Civil society of two countries should engage with each other. Civil society in India enjoys considerable amount of influence that could be used in bridging dialogue gap that Indian and Chinese common people have. Civil society in China is in fact a carrier of Chinese soft power that could be used for India-China people-to-people contact. This civil-society engagement could also garner support for the Chinese initiative which has a greater chance if China approaches it properly with utmost caution. India's concern about the Chinese initiative is basically strategic. China in order to mitigate those concerns should

make two-dimensional approach. First at the government level that both governments are already doing and the second at the public-level that could be done through civil-society dialogue.

**Converging the bilateral perception:** India and China both need to come out from their unilateral perception of each other. What India thinks about herself and what India thinks about China should converge with what China thinks about herself and India. Understanding about *Myself and Yourself* at both sides should come together to shape a better understanding. Only when China-India would realize this understanding then our politico-economic agenda could be merged together. China have an edge as she has been trying to understand Indian mind since last two thousand years but on the other side India has not tried to decipher Chinese thinking so intensely and for so long. India has a little understanding about China and this has often led to misinterpret the Chinese ideas and policy initiative. India must enhance her understanding about China for a better future.

## ROAD AHEAD FOR SINO-INDIA RELATIONSHIP

Sino-India relationship is now entering into a new phase of development. China seems ready on its own part as she is pushing for her own agenda in their bilateral, multilateral as well as regional relationship. With a New China, many old geo-politico-structures are bound to dismantle and would be replaced by new one putting China at the helm. India has just awoken to this new reality and is trying to adjust herself for the new role that she would be playing in this scenario. India must ponder what sort of relationship she would prefer with China in the coming future. India is cautious that China is going to be a great power and rule-maker in near future. India is also on path of becoming a self-reliant major power and would be in need of China's assistance for her own development as well as on many international issues. The recent fall back on the issue of terrorism and NSG in United Nation had shown India's vulnerability and her inability to persuade China. China understands India's compulsion and vulnerability and would play this card for extracting India's support for her own major initiatives such as OBOR initiative. India must show more pragmatism in her relationship to China as China had did with two major power US and Russia while pursuing her own development agenda. China's successful foreign policy with two major powers could be lesson for India if she want to maintain a favorable relationship with all the major powers.

## CONCLUSION

What India need to do is to be bold in her outreach to such initiative India's social parameters and insufficient infrastructure is a big hurdle in India's development that needs urgent solution. But the lack of funding and social complexities has complicated the task of India's policy makers for a quick solution. All the impending issues of India need a concerted effort for few decades to come over and that's where India falls as it doesn't have much time. India's demographic dividend is only for few decades and then it would become more complicated. This is the opportune time for India. India does not have enough resource to fulfill her development requirement and so China's such initiative may be a boon for India. India ought not miss any opportunity for her own development.

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# PRODUCTIVITY PERFORMANCE OF SELECTED CAPITAL GOODS INDUSTRIES IN INDIA

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## ABSTRACT

*In this study an investigation has been made to analyze the productivity performance of selected capital goods industries in India from 2006-2007 to 2015-16. Tools such as coefficient of variation, productivity indices and linear regression models have been used to analyse the data. The basic data sources of the data were Annual Survey of Industries (ASI) published by Central Statistical Organization (CSO), Government of India and Economic Survey. All the referred variables have been normalized by applying Gross Domestic Product (GDP) deflator. It is found that growth of net value added was more than fivefold in the manufacturing of coke, refined petroleum products and nuclear fuel. There has been declining trend in the growth of selected capital goods industries in terms of number of firms. The increasing trends in labour productivity and capital productivity have been observed in all the capital goods industries. The skill of the workers has shown stability in the growth over the period selected for the study. More than two fold changes in capital intensity has also been observed at the end of the period excepting manufacturing of coke, refined petroleum products and nuclear fuel. The growth of total factor productivity has been gradually increasing. Out of five variables selected for total factor productivity model, mixed relationships have been observed between dependent and independent variables.*

**Keywords:** Capital available per worker, capital intensity, capital productivity, labour productivity, scales of production, capital available per worker, skills, technology.

## INTRODUCTION

Industrial development is the key factor for the rapid economic development of any country. It is truer in the case of developing countries, since, it would be helpful to combating many economic ills, which they have been facing. Economic reforms introduced in India,

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particularly since 1991, are aimed at making its economy and industry more competitive. Liberalization and globalization have provided opportunity for the growth and expansion of the industry, and the manufacturing sector in particular (Ravi Kiran and Manpreet Kaur, 2008). Productivity of an organization is defined as the ratio of outputs produced by the organization and the resources consumed in the process. Productivity is used to assess the extent to which certain outputs can be extracted from a given input. There can be many different types of productivity measurements depending on the type of resources considered. Some of the most common types of productivity measurements include labour productivity, machine or capital productivity. The partial productivity ratios are the simplest measure of productivity and are derived by dividing the output by relevant factor input. Naturally, there can be as many partial productivity ratios as there are inputs. The most commonly used and widely reported partial productivity ratios are labour productivity ratio and capital productivity ratio. The partial productivity ratio relates output to the input of a single factor. The increase in partial productivity ratio means that over a period of time more output is possible with decreasing amounts of inputs or with same inputs or same output with lesser inputs. The inverse of these partial productivity ratios implies unit requirement of factor concerned for per unit output. The study of a partial productivity ratio is very helpful in measuring the saving in use of that particular factor over a period of time.

Productivity growth has traditionally been regarded as one of the main sources of income growth, along with capital accumulation and the deepening of human capital development. These factors and the historically established positive relationship between productivity, employment and earnings have made productivity improvement and it is now recognized as an important policy lever for economic development. Advocates of liberalization argue that opening up local markets to foreign competition and foreign direct investment will help to improve the productivity of domestic industry, resulting in more efficient allocation of resources and greater overall output. Productivity and efficiency are the two most important aspects to describe the relative performance of firms, producers or production units. It is necessary in this connection to recognize those factors which are exogenous to the system of production and which can account for inter-firm variations in efficiency and productivity. Productivity growth and productivity differential has been one of the most popular areas of applied economic research as it is based on the well-defined analytical framework of the standard economic theory of the production function. But the primary weakness of this approach of measuring performance of production units through productivity growth is that it does not allow for the distinction between changes in technology and those in the efficiency with which a known technology is applied to production. That is technological progress and efficiency of factor use cannot be disentangled. But productivity across firms in an industry may vary due to technological differences, due to differences in the environment in which the production unit or firm operates. The traditional methodology of measuring productivity based on the standard definition of production function implicitly assumes that maximum output is attained by firms or production units for given levels of inputs. That is, output maximization is an implicit assumption.

Since the Great Depression of 1930s, a spontaneous upsurge of interest has developed in

measuring the performance of an economy by taking into account data on productivity. In case of analysis of productivity to gauge relative performance of individual enterprises, a similar interest is discernible in various countries. For maintaining and sustaining a higher level of performance, it is imperative that the productivity process is so geared and organized as to yield an optimum and progressively higher reinvestment potential in future. The surplus that the economy generates depends primarily on the qualitative, quantitative and efficient use of inputs in a system. An appropriate index of efficiency in the resource use is provided by the various productivity measures. Productivity analysis, thus, acquires great significance in the context of the growth of developing economies. In its wide sense, the concept of productivity refers to the relationship between economic resources used in production and the resultant output of goods and services. Productivity is thus, a war on waste and inefficiency; it is a way of life and an attitude of mind; it is a constant and continuous effort at improving things. The drive or movement for higher productivity is the need of the day and the entrepreneurs whether they are in industry, agriculture or tertiary sectors should be conscious and fully aware of making economic use of scarce resources of a nation. An atmosphere of productivity culture should prevail so that the targets of the enterprise and the nation as a whole may be attained. Productivity can be measured conventionally using indices like labour and capital productivity. A single yardstick to measure the productivity of any, manufacturing system, with so many inputs is really an oversimplification. One way to overcome this drawback is to compare output to a weighted combination of various inputs such as labour, capital, materials and various other inputs. This is called total factor productivity.

Also the need for studying productivity growth arises due to the intimate link between productivity growth and economic growth. Economic growth has implications for resource use in general. Productivity growth is the basis of efficient economic growth. Economic growth has been defined as the process of a sustained increase in the production of goods and services with the aim of making available a progressively diversified basket of consumption goods to population. Scarcity of resources, which includes physical, financial and human resources, has been recognized as a limiting factor on the process of economic growth. While output expansion based on increased use of resources is feasible, it is not sustainable. Therefore, efficiency or productivity of resources becomes a critical factor in economic growth. These terms, which will be defined more precisely in the following section, indicate ability to obtain a given amount of good or service by using a lesser amount of input. Size, wage, output and capital intensity have been recognized as important parameters in the evolution of any industry. They also determine the productivity level of an industry. Therefore before analysing the determinants of partial total factor productivity indices, efforts were also taken in this study to examine the trends in the growth of the above mentioned variables.

## **OBJECTIVES**

In view of the above points, the investigators have undertaken this study relating to manufacture of capital goods industries in India with the following objectives. They are to analyze:

1. Trends in size of the industries, net value added, real wage and capital intensity.
2. Trends in labour productivity, capital productivity and total factor productivity.
3. Determinants of partial and total factor productivity growth.

## METHODOLOGY

The basic data source of the study was Annual Survey of Industries (ASI) published by Central Statistical Organization (CSO), Government of India covering the period from 2006-2007 to 2015-16. All the referred variables were normalized by applying Gross Domestic Product (GDP) deflator. The GDP at current and constant prices were obtained by referring to *Economic Survey*, published by the Government of India, Ministry of Finance and Economic Division, New Delhi. Several statistical tools were used to analyze the data. Those are discussed in next section.

## TOOLS OF ANALYSIS

### a. Productivity Indices:

Labor Productivity (PFPL) is measured as a ratio of net value added to total number of persons employed. Capital Productivity (PFPK) is measured as a ratio of net value added to gross fixed capital. Total factor productivity (TFP), in a simple way, is defined as output per unit of inputs. It is the ratio of aggregate output index to aggregate input index and measures the efficiency of all inputs in a production process. In other words, TFP is the portion of output not explained by the amount of inputs used in production. This is known as a residual and is calculated by making use of the formula as follows.

$$TFPDM = \sqrt{PFPK} \times \sqrt{PFPL}$$

where TFPDM=Total Factor Productivity Index By Direct Method

PFPL=Partial Factor Productivity of Labor

PFPK=Partial Factor Productivity of Capital

### b. Multiple Regression Models:

The dependent variables were Labor Productivity (LP), Capital Productivity (CP) and Total Factor Productivity Index By Direct Method (TFPDM) and the independent variables were Capital Intensity (CI), Growth Rate of Net Value Added (GRNVA), Size of the factories (SIZE) and real wage or skill of the workers (SKILL). The multiple regression model was used to estimate the models.

$$\text{Model-1 : } LP = \beta_0 + \beta_1 \text{ SIZE} + \beta_2 \text{ SKILL} + \beta_3 \text{ CI} + \beta_4 \text{ GRNVA}$$

$$\text{Model-2 : } CP = b_0 + b_1 \text{ SIZE} + b_2 \text{ LP} + b_3 \text{ SKILL} + b_4 \text{ CI} + b_5 \text{ GRNVA}$$

$$\text{Model-3 : } TFPDM = \alpha_0 + \alpha_1 \text{ SIZE} + \alpha_2 \text{ LP} + \alpha_3 \text{ SKILL} + \alpha_4 \text{ CI} + \alpha_5 \text{ GRNVA}$$

Where

LP=Labor Productivity indices measured as the Output -Labor ratio

CP=Capital Productivity indices measured as the Output -Capital ratio

TFPDM =Total Factor Productivity indices computed by the Direct Method.

GRNVA = Growth Rate of Net Value added in year 't' i.e.  $(Q_t - Q_{t-1}) / Q_{t-1}$ .

CI = Capital Intensity measured as the Capital- Labor ratio.

SIZE = Industry size calculated as the number of employees over the number of firms in the industry.

SKILL = Skill of workers calculated as the real wages by the number of workers.

$\beta_0, \alpha_0, b_0$  = Constant coefficients of different models

$\beta_1, \beta_2, \beta_3, \beta_4$  = Coefficients of SIZE, SKILL, CI, GRNVA respectively in Model--1

$b_1, b_2, b_3, b_4, b_5$  = Coefficients of SIZE, LP, SKILL, CI, GRNVA respectively in Model--2

$\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5$  = Coefficients of SIZE, LP, SKILL, CI, GRNVA respectively in Model—3

### c. Co-efficient of variation:

The coefficient of variation (CV) is defined as the ratio of the standard deviation  $\sigma$  to the mean  $\mu$ :

$$cv = \sigma / \mu \times 100$$

It shows the extent of variability in relation to the mean of the population.

## RESULTS AND DISCUSSION

### 1. Trends in Size of Industries:

The trends in the growth of size of the industries from 2006-07 to 2015-2016 for the selected capital goods industries is presented in Table 1.

**Table 1: Growth Of Size Of The Industries**

(2006-07=100)

Industry Year	Basic Metals	Coke, Refined Petroleum Products and Nuclear Fuel	Machinery & Equipment	Electrical Machinery	Transport Equipments
2006-07	100	100	100	100	100
2007-08	98	106	100	109	86
2008-09	97	97	101	114	77
2009-10	93	96	95	103	83
2010-11	88	92	91	91	73
2011-12	79	81	79	83	54
2012-13	73	71	96	79	69
2013-14	74	62	66	84	63
2014-15	76	71	70	74	61
2015-16	87	98	78	85	71
Mean	86.50	87.40	87.60	92.20	73.70
S.D.	10.40	15.01	13.19	13.52	13.47
C.V.	12.06	17.16	15.50	14.95	18.20

**Source:** Annual Survey of Industries, (ASI)

(Calculations are based on ASI data).

The indices regarding the growth of firm size shows that there were declining trend in the growth of selected capital goods industries in terms of number of firms. But the decline in the growth was accounted for more stability.

## 2. Trends in the Growth of Net Value Added:

The trends in the growth of net value added from 2006-07 to 2015-16 for the selected capital goods industries is presented in Table 2.

**Table 2: Growth Of Net Value Added**

(2006-07=100)

Industry Year	Basic Metals	Coke, Refined Petroleum Products and Nuclear Fuel	Machinery & Equipment	Electrical Machinery	Transport Equipments
2006-07	100	100	100	100	100
2007-08	157	236	92	104	115
2008-09	232	323	111	112	135
2009-10	407	401	139	135	169
2010-11	352	571	183	215	204
2011-12	520	201	233	320	277
2012-13	730	871	296	363	223
2013-14	295	933	402	410	273
2014-15	619	824	415	492	373
2015-16	696	1033	471	578	477
Mean	441	549	244	283	235
S.D.	226.04	342.4	143.30	175.08	119.68
C.V.	51.28	62.33	58.69	61.89	51.01

**Source:** Annual Survey of Industries, (ASI)

(Calculations are based on ASI data).

It is very clear from the Table 2 that growth of net value added was more than five fold in the manufacturing of coke, refined petroleum products and nuclear fuel. This was followed by basic metals (6.96 -fold), electrical machinery (4.71-fold), machinery & equipment (5.78-fold) and transport equipments (4.77- fold). But this much of growth from the beginning of the period to the end of the period was attained with greater instability. The co-efficient of variation across the industries ranged between 51.01 and 62.3 percent.

### 3. Trends in Skill (real wage) of Workers

Real wage is measured in terms of GDP. Total wage divided by wage is termed as real wage. The trends in the growth of skill of workers from 2006-07 to 2015-16 for the selected capital goods industries is presented in Table 3.

**Table 3: Growth Of Real Wage (SKILL) Of The Workers**

(2006-07=100)

Industry Year	Basic Metals	Coke, Refined Petroleum Products and Nuclear Fuel	Machinery & Equipment	Electrical Machinery	Transport Equipments
2006-07	100	100	100	100	100
2007-08	107	93	97	123	102
2008-09	113	87	104	122	107
2009-10	106	97	102	123	111
2010-11	103	99	105	123	111
2011-12	103	112	129	127	148
2012-13	124	107	122	140	134
2013-14	127	120	152	142	129
2014-15	122	131	159	168	158
2015-16	147	189	158	181	168
Mean	115.15	113.45	122.79	134.71	126.80
S.D.	14.66	29.49	25.25	23.92	24.66
C.V.	12.73	25.99	20.56	17.76	19.45

**Source:** Annual Survey of Industries, (ASI)

(Calculations are based on ASI data).

Details regarding the skill of the workers have shown stability in the growth over the period selected for the study. There is absence of wider differences in the average growth of the capital goods industries. It ranged between 113.45 and 134.71 units across the industries under study. The manufacturing of electrical machinery and transport equipments has shown gradual increase from the beginning to the end of the period.

### 4. Trends in Capital Intensity (K/L)

The trends in the growth of the Capital Intensity (amount of capital divided by labour force) from 2006-07 to 2015-16 is presented for the selected capital goods industries vide Table 4.

**Table 4: Growth Of Capital Intensity****(2006-07=100)**

<b>Industry Year</b>	<b>Basic Metals</b>	<b>Coke, Refined Petroleum Products and Nuclear Fuel</b>	<b>Machinery &amp; Equipment</b>	<b>Electrical Machinery</b>	<b>Transport Equipments</b>
<b>2006-07</b>	100	100	100	100	100
<b>2007-08</b>	109	108	111	128	102
<b>2008-09</b>	127	133	111	112	107
<b>2009-10</b>	128	100	108	95	100
<b>2010-11</b>	140	109	129	104	126
<b>2011-12</b>	135	107	123	111	125
<b>2012-13</b>	151	90	147	128	158
<b>2013-14</b>	171	94	173	101	186
<b>2014-15</b>	275	166	208	182	237
<b>2015-16</b>	259	196	229	204	239
<b>Mean</b>	159.43	120.25	143.85	126.41	147.88
<b>S.D.</b>	60.09	34.83	45.13	37.11	54.87
<b>C.V.</b>	37.69	28.97	31.37	29.36	37.10

**Source:** Annual Survey of Industries, (ASI)

(Calculations are based on ASI data).

The growth of capital intensity in the industries has shown more than two- fold increase at the end of the period except manufacture of coke, refined petroleum products and nuclear fuel. The co-efficient of variation explains the fact that stability was not maintained in the growth of capital intensity. Manufacture of basic metals and transport equipments have shown changes without any fluctuations across the period.

### 5. Trends in Labour Productivity:

The trends in the growth of labour productivity from 2006-07 to 2015-16 for the capital goods industries is presented in Table 5.

**Table 5 : Growth Of Labour Productivity**

**(2006-07=100)**

Industry Year	Basic Metals	Coke, Refined Petroleum Products and Nuclear Fuel	Machinery & Equipment	Electrical Machinery	Transport Equipments
2006-07	100	100	100	100	100
2007-08	158	235	92	121	112
2008-09	233	303	113	136	128
2009-10	378	344	125	146	149
2010-11	290	450	155	196	167
2011-12	354	151	172	270	178
2012-13	466	519	202	270	174
2013-14	343	534	263	269	197
2014-15	356	446	286	269	263
2015-16	363	623	271	280	286
Mean	304	370.38	178	205.66	175.42
S.D.	110.55	173.11	74.15	73.44	60.79
C.V	36.18	46.76	41.24	35.61	34.29

**Source:** Annual Survey of Industries, (ASI)

(Calculations are based on ASI data).

The increasing trend in labour productivity was observed in all the capital goods industries. It is interesting to note that manufacture of coke, refined petroleum products and nuclear fuel recorded highest growth which was more than six-fold among the selected industries. With regard to the magnitude of variability in the selected capital goods industries, not many differences were observed. The growth was not consistent over the reference period under study.

### 6. Trends in Capital Productivity:

The trends in the growth of capital productivity from 2006-07 to 2015-16 for the selected capital goods industries is presented in Table 6.

**Table 6: Growth Of Capital Productivity****(2006-07=100)**

<b>Industry Year</b>	<b>Basic Metals</b>	<b>Coke, Refined Petroleum Products and Nuclear Fuel</b>	<b>Machinery &amp; Equipment</b>	<b>Electrical Machinery</b>	<b>Transport Equipments</b>
<b>2006-07</b>	100	100	100	100	100
<b>2007-08</b>	145	217	83	95	109
<b>2008-09</b>	183	228	102	122	120
<b>2009-10</b>	296	344	116	155	149
<b>2010-11</b>	206	415	120	189	132
<b>2011-12</b>	263	141	140	243	143
<b>2012-13</b>	308	574	138	210	110
<b>2013-14</b>	199	570	153	161	106
<b>2014-15</b>	129	269	138	148	110
<b>2015-16</b>	140	317	118	137	120
<b>Mean</b>	196	317	120	156	110
<b>S.D.</b>	72	162	21	47	38
<b>C.V.</b>	36.73	51.10	17.50	30.13	35.45

**Source:** Annual Survey of Industries, (ASI)

(Calculations are based on ASI data).

Details on capital productivity growth in the capital goods industries shows that from the beginning of the period to the end of period, the growth was maximum for coke, refined petroleum products and nuclear fuel(3.17- fold) followed by basic metals (1.40- fold), electrical machinery(1.37- fold), transport equipment (1.20- fold). This is also evident based on the average growth figures. There was not much difference in the magnitude of variability in the growth of labour productivity.

### **7. Trends in Total Factor Productivity**

The trends in total factor productivity from 2006-07 to 2015-16 for the selected capital goods industries is presented in Table7.

**Table 7: Growth Of The Total Factor Productivity****(2006-07=100)**

<b>Industry Year</b>	<b>Basic Metals</b>	<b>Coke, Refined Petroleum Products and Nuclear Fuel</b>	<b>Machinery &amp; Equipment</b>	<b>Electrical Machinery</b>	<b>Transport Equipments</b>
<b>2006-07</b>	100	100	100	100	100
<b>2007-08</b>	151	226	276	107	110
<b>2008-09</b>	206	264	107	129	124
<b>2009-10</b>	334	344	120	150	149
<b>2010-11</b>	244	432	136	192	148
<b>2011-12</b>	305	146	155	256	160
<b>2012-13</b>	379	546	167	238	138
<b>2013-14</b>	261	552	201	208	145
<b>2014-15</b>	215	346	199	200	171
<b>2015-16</b>	225	444	179	196	158
<b>Mean</b>	242.17	339.95	164.10	177.66	143.04
<b>S.D.</b>	83.13	156.57	53.18	53.64	26.23
<b>C.V.</b>	34.33	46.06	32.41	30.19	18.34

**Source:** Annual Survey of Industries, (ASI)

(Calculations are based on ASI data).

Details on total factor productivity indices of the selected capital goods industries show that fluctuations were not observed during the reference period. In other word, the growth of total factor productivity was gradually increasing. Only in transport- equipment industry, stability was greater when compared to other industries under study. The co-efficient of variation ranged between 18.34 percent and 46.06 percent.

### **8. Determinants of Partial and Total Factor Productivity:**

The regression coefficients of labour productivity model are presented in Table 8.

**Table 8: Regression Co-efficients Based On Labour Productivity Model**

<b>Regression Coefficients</b>	<b>Basic Metals</b>	<b>Coke, Refined Petroleum Products and Nuclear Fuel</b>	<b>Machineries and Equipments</b>	<b>Electricals Machinery</b>	<b>Transport Equipments</b>
<b>Intercept (<math>\beta_0</math>)</b>	-43.541 (-0.170)	-133.203 (-1.412)	244.875 (2.095)	244.779 (1.808)	112.154 (1.631)
<b>LnSIZE (<math>\beta_1</math>)</b>	0.446 (1.621)	0.302** (3.327)	-0.462 (-2.211)	-0.312 (-1.099)	-0.079 (-.079)
<b>LnSKILL (<math>\beta_2</math>)</b>	-0.446 (-2.009)	-0.229 (-1.848)	0.116 (0.116)	0.355 (0.355)	0.187 (0.187)
<b>LnCI (<math>\beta_3</math>)</b>	-0.187 (-1.018)	-0.022 (-0.202)	0.475 (1.602)	-0.449 (-1.728)	0.291 (2.048)
<b>LnGRNVA (<math>\beta_4</math>)</b>	1.766** (4.849)	0.312* (11.453)	0.000 (0.001)	0.669 (1.142)	0.842** (3.436)
<b>R Square</b>	0.942	0.982	0.990	0.939	0.985
<b>D-W Statistics</b>	1.247	1.223	2.135	1.660	2.299
<b>F-Value</b>	20.148*	68.030*	119.604*	19.092*	84.288*

**Source:** Calculations are based on ASI data

Note: \*significant at 1%level

\*\*significant at 5% level

Figures in parentheses indicate 't' values.

From the regression model based on labour productivity, it is seen that the same is good at 1% level. The co-efficient of determination  $R^2$  explain the validity of the variables selected for the model. It ranged between 0.939 and 0.990. This indicates the fact that more than 90% of the changes in labour productivity can be explained by the independent variables selected for the analysis purpose. Out of five variables selected, growth of net value added in the manufacture of basic metals, size of industries in the manufacture of coke, refined petroleum products and nuclear fuel and transport equipments were found to be statistically significant.

The detail on determinants of capital productivity based on regression model is presented in Table 9.

**Table 9: Regression Co-efficients Based On Capital Productivity Model**

<b>Regression Coefficients</b>	<b>Basic Metals</b>	<b>Coke, Refined Petroleum Products and Nuclear Fuel</b>	<b>Machineries and Equipments</b>	<b>Electricals Machinery</b>	<b>Transport Equipments</b>
<b>Intercept (<math>\beta_0</math>)</b>	91.169 (2.061)	385.313* (10.427)	7377.987** (3.078)	100.164 (0.649)	113.259** (4.203)
<b>LnSIZE (<math>\beta_1</math>)</b>	0.082 (0.909)	-0.029 (-0.508)	-4.806** (-3.297)	-0.190 (-0.438)	-0.089 (-0.825)
<b>LnLP (<math>\beta_2</math>)</b>	1.318* (11.116)	0.902** (5.713)	-6.566** (-2.959)	2.186** (3.560)	3.932* (3.932)
<b>LnSKILL (<math>\beta_3</math>)</b>	-0.087 (-1.097)	-0.123 (-2.158)	0.553 (0.542)	-0.285 (-0.376)	0.018 (0.065)
<b>LnCI (<math>\beta_4</math>)</b>	-0.663* (-12.375)	-0.589* (-15.235)	6.315** (3.491)	0.206 (0.458)	-3.267* (-14.340)
<b>LnGRNVA (<math>\beta_5</math>)</b>	-0.201 (-0.872)	0.203 (0.962)	-4.793 (-2.091)	-1.716 (-1.900)	-0.879 (-1.657)
<b>R Square</b>	0.997	0.998	0.996	0.907	0.984
<b>D-W Statistics</b>	3.048	2.005	2.465	1.366	3.022
<b>F-Value</b>	242.563*	443.902*	3.129	7.831**	48.252*

**Source:** Calculations are based on ASI data

**Note:** \* significant at 1% level

\*\* significant at 5% level

Figures in parentheses indicate 't' values.

From the regression model based on capital productivity, it was found that the fit was good at 1% level except the manufacture of machineries and equipment. The co-efficient of determination ranged between 0.907 and 0.999. This indicates the fact that more than 90% of the changes in capital productivity can be explained by the independent variables selected for the analysis purpose. Out of five variables selected, labour productivity was statistically significant in all the manufacturing sectors such as basic metals, coke, refined petroleum products and nuclear fuel, machineries and equipments, transport and equipments. The skill in the manufacture of basic metals, capital intensity in the manufacture of coke, refined petroleum products and nuclear fuel and size, capital intensity in the manufacturing of both machineries and equipments and transport equipments were found to be statistically significant.

Details on determinants of capital productivity based on regression model are presented in Table 10.

**Table 10: Regression Co-efficients Based On Total Factor Productivity Model**

<b>Regression Co-efficients</b>	<b>Basic Metals</b>	<b>Coke, Refined Petroleum Products and Nuclear Fuel</b>	<b>Machineries and Equipments</b>	<b>Electrical Machinery</b>	<b>Transport Equipments</b>
<b>Intercept (<math>\alpha_0</math>)</b>	72.041 (2.739)	231.003* (12.816)	1930.844** (3.261)	56.030 (0.696)	87.597** (4.618)
<b>LnSIZE (<math>\alpha_1</math>)</b>	0.015 (0.319)	-0.030 (-1.031)	-5.126** (-3.385)	-0.096 (-0.481)	-0.100 (-2.115)
<b>LnLP (<math>\alpha_2</math>)</b>	1.269* (20.783)	1.037* (12.981)	-6.074 (-2.636)	1.745* (6.164)	2.256* (9.768)
<b>LnSKILL (<math>\alpha_3</math>)</b>	-0.027 (-0.652)	-0.086** (-3.000)	0.524 (0.494)	-0.156 (-0.447)	-0.030 (-0.246)
<b>LnCI (<math>\alpha_4</math>)</b>	-0.401* (-14.541)	-0.330* (16.843)	6.391** (3.402)	0.116 (0.560)	-1.200* (-12.051)
<b>LnGRNVA (<math>\alpha_5</math>)</b>	-0.151 (-1.269)	0.076 (0.712)	-4.979 (-2.091)	-0.924 (-2.219)	-0.234 (-1.008)
<b>R Square</b>	0.999	0.990	0.970	0.980	0.997
<b>D-W Statistics</b>	2.988	1.997	2.494	1.407	2.274
<b>F-Value</b>	917.335*	1736.711*	2.841	39.831*	255.817*

**Source:** Calculations are based on ASI data

**Note:** \*significant at 1% level

\*\* significant at 5% level

Figures in parentheses indicate 't' values.

From the regression model based on total factor productivity, it is found that the productivity was good at 1% level except for the machineries and equipments. The  $R^2$  value ranged between 0.970 and 0.999. This indicates the fact that more than 90% of the changes in total factor productivity can be reasonably explained by the independent variables selected for the analysis purpose. Out of five variables selected, capital intensity in the manufacturing of all electrical and machinery and labour productivity excepting machineries and equipments were statistically significant. Though the skill of the workers had positive relationship only in the manufacture of machineries and equipment, but it was not statistically significant.

## CONCLUSION

The above analysis clearly explains the fact that labour productivity is an indicator of efficiency whenever labour is used in the production process. Differences in labour

productivity arise from differences in the scale of production(LnGRNVA), the amount of capital available per worker(LnCI), the skills possessed by workers(LnSKILL) and other organizational characteristics including technology(LnCI) possessed by firms in the capital goods industries of India. Efficiency of capital productivity and total factor productivity has been found to be always associated with labour productivity in the sphere of current study.

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# MAGNITUDE OF CHILD LABOUR AMONG MUSLIM MINORITY CHILDREN AND RIGHT TO EDUCATION ACT, 2009

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## ABSTRACT

*Children are the future citizens of the nation and their complete development should be the utmost priority of any country. But unfortunately, many of our future citizens are forced to engage as child labour. The present study focuses on the magnitude of child labour among Muslim minority community. Data was collected from 250 Muslim and 100 other community families from five villages of five sub-divisions of the district South 24 Parganas of West Bengal by applying multi-stage random sampling technique and using self-made household survey schedule. The study found that, after implementation of Sarva Shiksha Abhiyan programme and Right to Education Act, 2009; the number of child labour among Muslim minority community has decreased significantly. But, till now a large section of Muslim male children (20%) and female children (4%) is engaged as child labour in different sectors. The problem of child labour was more prominent among Muslim minority than other community. More Muslim boys than girls were found to be engaged as child labour in all the phases. Majority of the child labours of Muslim minority community are compelled to work due to extreme poverty. The lower participation of female children as child labour is mainly because of the attitude of guardians towards the education of girl children has changed over the time mainly due to adoption of small family size and effect of some government projects like Kanyashree project, pre-metric scholarship, etc.*

**Keywords:** Child labour, Muslim minority, poverty, Right to Education.

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## **INTRODUCTION**

Children are the greatest gift of God for human society and childhood is an important stage of human development as it holds the potential for the future development of any society. Every society links its future with the present status of its children. Due to poor economic condition, children are forced to forego educational opportunities and take up jobs which are mostly exploitative as they are usually underpaid and engaged in hazardous condition. Child labour refers to the employment of children in any activities that deprives children of their childhood, interferes enrolment and regular attendance in schools and that is mentally, physically, socially or ethically dangerous and harmful. The most disconcerting aspect of child labour is that children are sent to work at the expense of their elementary education.

It has been calculated that there are 168 million child labours around the world today. According to the 66<sup>th</sup> round of survey of National Sample Survey Organization(NSSO) on child labour in major Indian states(2009-10),the number of child labour in West Bengal is 5.5 lakh (Male: 3.89 lakh, Female: 1.6 lakh). According to the Census 2011, the number of working children in the age group 5-14 years in West Bengal has declined to 2.3 lakh. Indian laws have banned child labour. But laws are empty gestures if divorced from economic realities. If people remain in poverty, they will require the labour of their children to survive. The economic status of a family is a powerful force shaping its behaviour in many aspects of life including the engagement of their children in productive labour thus restricting their participation in schooling. The Indian Human Development Survey shows that incidence of poverty was highest among STs (49.6%), followed by SCs (32.3%) and then Muslim minority (30.6%). However, recent trends in enrolments clearly indicate that poor parents are increasingly sending their children to school including private fee charging schools. While some poor households may be unwilling to send their children to school, some others with similar socio-economic conditions ensure education of their children.

The passing of the Rights of Children to Free and Compulsory Education Act (RTE), 2009 by Indian Parliament on 4<sup>th</sup> August 2009 marks a historic moment for the children of India. For the first time in Indian history, children have been guaranteed their right to quality elementary education by the State with the support of families and communities. According to this Act, all children between the age group 6-14 years shall have the right to free and compulsory elementary education at a neighbourhood school irrespective of caste, creed, colour and religion. There is no direct (school fees) or indirect costs (uniforms, textbooks, mid-day meals, transportation etc) to be borne by the child or their parents to obtain elementary education. The government will provide schooling free of cost until a child's elementary education is completed.

## **SIGNIFICANCE OF THE STUDY**

Muslims are the principal minority group and second largest religious group after Hindus in India. Development of any country depends upon the homogeneous development of every segment of its population. In spite of being the largest minority group in India,

they are educationally, economically, and politically most backward than other minority groups like Sikhs, Christians, Buddhists, Jains and Parsis. A significant number of Muslim children are forced to engage in child labour due to extreme poverty. There is a strong effect of child labour on school enrolment, attendance, and retention. Child labour restricts the right of children to access and benefit from education and denies the fundamental opportunities to get education.

While reviewing the related studies, the researcher found that very few research works have been done regarding the child labour and RTE Act, 2009. Although, it is necessary to know that, after implementation of RTE Act, 2009 whether the number of child labour has decreased or not. It is also necessary to know that if there are any relationship between child labour and dropout of minority Muslim boys in elementary level of education. The researcher found that, there is no such empirical study. Therefore, it is significant and relevant to study the magnitude of child labour among minority Muslim children and examine the efficacy of the Right to Education Act, 2009.

### **OBJECTIVES OF THE STUDY**

The following objectives were taken for the present study:

1. To study the present scenario of child labour of Muslim children at elementary education.
2. To compare the present status of child labour between Muslim boys and Muslim girls.
3. To compare the problem of child labour among Muslim children before and after implementation of the RTE Act, 2009.
4. To compare the problem of child labour between Muslim community and children from other communities.

### **METHODOLOGY**

#### **Sampling Techniques and Sample Size**

Multistage stratified random sampling technique was adopted for selecting the sample. The South 24 Pargana district is a mixed populated district comprising of 35.6% of Muslim minority population (Census 2011). The Muslim population is scattered through the five sub-divisions with varying level of educational standards and practices. Five (5) such mixed populated villages from five sub-divisions were identified from the district with the help of Census 2011 data. From these villages, only those families which had children of the age group 6 to 14 years were identified. Among them, fifty (50) Muslim families and twenty (20) other community families from each such village were selected randomly for the purpose of the present study. Thus,  $50 \times 5 = 250$  (two hundred and fifty) Muslim families and  $20 \times 5 = 100$  (one hundred) other community families were taken as the sample.

#### **Tool**

Household survey schedule was used. It was prepared by the researchers and finalized on the basis of experts' opinion.

### Analysis of Data

To study the problem of child labour, changes of educational scenario and dropout of Muslim children at elementary education, analysis was done by dividing the collected data in three phases. The investigation concerns with problem of child labour among Muslim minority children before and after the implementation of the RTE Act, 2009. The target population for the present study was the Muslim children of age group between 6-14 years in the rural areas of West Bengal. In order to make a comparative study of child labour before and after the implementation of the RTE Act, 2009, children were divided into three age groups- (i) 6-14 years (Phase I: After implementation of RTE Act, 2009), children of this age group were particularly focused to access the impact of the RTE Act, 2009, (ii) 14-22 years (Phase II: Before implementation of RTE Act, 2009), children of this age group availed the benefits of Sarva Shiksha Abhiyan (SSA) programme but could not avail the benefits of the RTE Act, 2009. (iii) 22-30 years (Phase III: Before implementation of SSA), children of this group partly availed the benefit of Sarva Shiksha Abhiyan (SSA) programme as it was being implemented from the year 2001 and onwards. The details of the three phases are described in the following table.

To fulfil the objectives of the research study, both quantitative as well as qualitative analysis was done. For quantitative analysis, various statistical techniques like percentage, mean, and Z-test have been adopted. On the other hand, qualitative analysis was done on the basis of observations and discussions with the children, head of the families, and other family members during the households survey.

### FINDINGS AND DISCUSSION

**Table 1: Phase-wise, Community-wise and Gender-wise Child Labour**

Phase	Community	Male (%)	Female (%)	Total (%)
<b>Phase I</b>	Muslim	19.31	3.9	11.5
	Other	1.64	0.0	0.9
<b>Phase II</b>	Muslim	45.21	2.6	19.3
	Other	9.09	0.0	1.8
<b>Phase III</b>	Muslim	56.41	17.9	38.6
	Other	14.29	2.9	9.1

The data presented in the above table shows that, before implementation of SSA programme, nearly 40% of Muslim children and 10% of other community children were found to be engaged in child labour. After implementation of SSA programme the percentage of child labour decreased to nearly 20% and 2% of Muslim and other community children, respectively. After implementation of the RTE Act, 2009, the number of child labour further decreased but till now nearly 12 % children of Muslim minority community and about 1% children of other community are engaged in child labour. It was also found that the problem of child labour was more prominent among Muslim minority children than their counterpart in other communities. Again, among Muslim children, more Muslim boys than girls were found to be engaged as child labour in all the phases.

**Table 2: Comparison of Phase-wise Child Labour of Muslim Children**

Phase	Total Number of Children	Number of child labour	Proportion	Z-value
Phase I	408	47	0.1152	2.5270 <sub>s</sub>
Phase II	187	36	0.1925	
Phase II	187	36	0.1925	4.4644 <sub>s</sub>
Phase III	290	112	0.3862	
Phase I	408	47	0.1152	8.4130 <sub>s</sub>
Phase III	290	112	0.3862	

$Z_{0.05}=1.64$ , s=significant

The Z-values for comparison of phase-wise number of child labour of Muslim children are presented in the above Table 2. It shows that the Z-values between Phase I and Phase II (2.5270<sub>s</sub>), Phase II & Phase III (4.4644<sub>s</sub>) and Phase I & Phase III (8.4130<sub>s</sub>) are all significant. The results indicate that, the number of child labour of Muslim children decreased from Phase III to Phase II and from Phase II to Phase I significantly.

**Table 3: Comparison of Community-wise Child Labour**

Phase	Community	Total Number of Children	Number of Child Labour	Proportion	Z-value
Phase I	Muslim	408	47	0.1152	3.4415 <sub>s</sub>
	Other	112	1	0.0089	
Phase II	Muslim	187	36	0.1925	3.2243 <sub>s</sub>
	Other	57	1	0.0175	
Phase III	Muslim	290	112	0.3862	4.9208 <sub>s</sub>
	Other	77	7	0.0909	

$Z_{0.05}=1.64$ , s=significant

The Z-values for comparison of community-wise number of child labour in all three phases are presented in the above table. It shows that the Z-values between Muslim and other community children in Phase I (3.4415<sub>s</sub>), in Phase II (3.2243<sub>s</sub>) and in Phase III (4.9208<sub>s</sub>) are significant.

**Table 4: Comparison of Gender-wise Child Labour of Muslim Children**

Phase	Gender	Total Number of children	Number of child labour	Proportion	Z-value
Phase I	Male	202	39	0.1931	4.8789 <sub>s</sub>
	Female	206	8	0.0388	
Phase II	Male	73	33	0.4521	7.2034 <sub>s</sub>
	Female	114	3	0.0263	
Phase III	Male	156	88	0.5641	6.7136 <sub>s</sub>
	Female	134	24	0.1791	

$Z_{0.05}=1.64$ , s=significant

The Z-values for comparison of gender-wise number of child labour of Muslim children in three phases are presented in the above Table 3 & 4. It shows that the Z-values between male and female children in Phase I (4.8789<sub>s</sub>), in Phase II (7.2034<sub>s</sub>) and in Phase III (6.7136<sub>s</sub>) are significant.

The lower percentage of engagement of female children as child labour can be explained by the fact that the attitude of parents towards the education of girl child has changed mainly due to the adoption of small family size. Pande (2001) also found that gender discrimination is declining due to adoption of small family size norm. The findings of Halder, K. (2002) has shown that dropout rates among the Scheduled Castes and Muslim Community are higher than those of general Hindu community. Sachar Committee Report has pointed out that; the situation of job opportunity for Muslim minority seems to be even worse than that of SCs and STs (Government of India, 2006) which affects the retention rate of Muslim minority children at elementary level of education.

Though, majority of dropout was caused due to the practice of child labour but interestingly it was found that the economic condition of many of these families with dropout children was above poverty line and in some cases their economic condition was found to be better than the families of school going children. The reason for this may be that, as those children are working and earning and contributing to the family income, so their economic condition has improved. Most of the dropout children and their parents mentioned that they observed that in their locality people who are illiterate or just merely educated but are engaged in different types of works like jewellery making (outside the home state), garment manufacturing, embroidery, or zari work etc. are leading a better life than those who are educated. On the other hand, economic condition of the educated youths of their locality is pathetic. They suffer from poverty and some of them even spend their whole life by doing private tuition and even working as factory labour. So, it may be concluded that now-a-days poverty is not the only cause for dropout. Propensity to earn greater amount of wealth, eagerness to be rich in a very short span of time and with minimal effort may be a major cause for dropout.

The study also revealed that, majority of the child labourers of Muslim minority community are compelled to work due to extreme poverty. They work longer as compared to money they receive in return. This was due to the fact that poverty mostly forced the male children to earn money for meeting family expenditure. As a result, near about one-fifth of the Muslim male children were found to be engaged as child labour in garment factory, jewellery factory (in other States), agricultural labour, hotel, bakery industry or working as domestic help, zari worker, rickshaw van puller, vegetables seller, vendor etc. But, in the same economic condition, only 4% Muslim female children were found to be engaged as child labour mainly as zari worker or as domestic help. This lower percentage of participation of female children in the labour market as child labour is mainly because the attitude of guardians towards the education of girl child has changed over the time mainly due to adoption of small family size and effect of some government projects like *Kanyashree* project, pre-metric scholarship, etc. Another reason for sending girls to school is that if girls become educated then there is better chance of getting suitable bridegroom for their marriage. Moreover, if the girls are educated then they can also help their children in their studies. As a result, parents are now more willing to send their girl child to school.

Another type of child labour identified by the researcher is prostitution. During the household survey the researcher found that a girl student of Class VII of a poor Muslim family of Canning area was kidnapped when she was going to school. After kidnapping the pimps sold the girl in a red light area. After that incident, she has been working as sexual child labour and dropped out from her elementary education. Though the researcher came across one such incident yet such type of child labour are found in many areas of different districts of West Bengal. Many such examples were noted by the researcher during discussion, but no one agreed to disclose the identity of those girls publicly as the work is illegal and they consider it as against their social dignity.

## CONCLUSION

After implementation of the Sarva Shiksha Abhiyan programme and Right to Education Act, 2009, the number of child labour among Muslim minority community has decreased significantly. But, till now a large section of Muslim male children (20%) and female children (4%) is engaged as child labour in different sectors like garment factory, jewellery factory (in other States), agricultural labour, hotel, bakery industry or working as domestic help, zari worker, rickshaw van puller, vegetables seller, vendor, sex-worker etc. It was also found that the problem of child labour was more prominent among Muslim minority children than their other community counterpart. Again, among Muslim children, more Muslim boys than girls were found to be engaged as child labour in all the phases. The study also revealed that, majority of the child labourers among Muslim minority community are compelled to work due to extreme poverty. The lower percentage of participation of female children was found in the labour market as child labour is mainly because of the attitude of parents towards the education of girl child that has changed over the time mainly due to adoption of small family size and effect of some government projects like *Kanyashree* project, pre-metric scholarship, etc. Another reason for sending girls to school is that if girls become educated then there is better chance of getting suitable bridegroom for their marriage. Moreover, if the girls are

educated then they can also help their children in their studies. As a result, parents are now more willing to send their girl child to school.

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# INDIGENOUS FOLK THEATRE OF KASHMIR AND IT'S RELEVANCE IN CONTEMPORARY SOCIETY

Ayash Arif\*

## ABSTRACT

*Bhand Pather is a legacy of Kashmiri culture. Theatre activity in Kashmir reached its heights during the ancient period of Kashmir history. Before the establishment of the Muslim Sultanate in Kashmir, theatre activity was largely associated with the socio-religious ceremonies. Performing in open- air theatre constituted one of the important royal entertainment activities. Bhand Pather as a semi-scripted performance by men dealt with variegated issues ranging from social, political to religious. This open-theatre art is replete with satire, dance, and music. There is tremendous possibility of integrating it with our cultural tourism. This can help in rescuing this art form from extinction. The paper provides history of this little known art form of Kashmir.*

**Keywords:** Akungam Bhaggats, Bhand, Bhand Pather, pantomime, polyphonic theatre.

## INTRODUCTION

Kashmir's distinct geo-cultural clime has endowed it with matchless artistic merit and skill among its inhabitants. Influenced by the countless treasures of its natural beauty in the form of lofty mountains, lakes, waterfalls and charming flowers of multitudinous colours and its unique religious plurality, this land has offered enough chances for its people to demonstrate immense degree of tolerance and sense of accommodation. This has resulted in the production of fables, fairy tales, epics, dramas and poetry. Receiving stimulus from natural beauty and its religious colorfulness, theatre activity in Kashmir reached its heights during the ancient period of Kashmir history. Before the establishment of the Muslim Sultanate in Kashmir, theatre activity of Kashmir was largely associated with the socio- religious ceremonies. Both archeological and literary evidences suggest that the theatre performance used to be organized on the eve of festivals and on the birthday of Buddha, Lord Krishna & other deities. In the backdrop of pre- Muslim religious fervor of Kashmir ; fine arts, like singing, sculpture, music, dance, and theatre performances were closely associated with different social and religious ritual activities. These arts, as such, were not looked from merely aesthetic and creative point of view, but taken as sacerdotal appendixes to fundamental devotional exercises. During

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the reign of Lalitaditya (reg. 724-760 A.D.), alongside other fine arts, drama also received royal patronage and artists were given every incentive to promote their talent. It is learnt that Lalitaditya in spite of his busy war schedule, would spare some time to watch theatrical performances performed by professional actors.

With the establishment of Muslim Sultanate in Kashmir, the theatre, in tune with the earliest Hindu traditions, continued to gain legitimacy from the spiritual centers. The only difference was that the place of matha and monasteries, and temples was taken by shrines, khanqahs and ṛṣi abodes. So deep was peoples' attachment to these actors of *Bhand Pather* that during the days of acute crises, heightened by natural calamities like floods, famines, epidemics fires and recurring earthquakes, common masses sought their help by organizing special prayers, performances at the shrines of Sufi and Ṛṣi saints. During their prayer performances, the Bhands were seen engrossed, with utmost degree of surrender and self denial. *Bandi duaayi khair* as it is called in the vernacular, forms the crux of every *Bhand Pather*. It is generally carried out by the *Maghun* (Head Bhand) at the shrine where all *Bhands* in traditional costumes used to play for divine aid and mercy.

The folk theatre, called *Bhand Pather*, is probably the earliest theatre specimen in the subcontinent. Though no serious attempt has been made to document this old extant art form, yet the traces of this kind of traditional theatre one can come across in some of the extant manuscripts. The word *bhand* with its origin in the Sanskrit *bhaand* meaning comical behaviour or imitation, is found in most of the north Indian languages.

The expression *Bhand Pather* is combination of two Sanskrit words *bhand* and *pathar*. The word *Bhand* stands for a jester and *pathar* means *patra*, a dramatic performer. But in Kashmiri parlance, *bhand* refers to folk actor and *pathar* points to dramatic performance with greater tinge of imitation and exaggeration. Though we hardly get any direct reference in *Nilmatapurana* and *Rajatarangani* about *Bhand Pather*, the art of drama had reached its perfection under the ancient Hindu Rule in Kashmir. Performing in open-air theatre constituted one of the important royal entertainment activities. It was not a theatre in the folk form, but it contained all the elements of elite and devotional theatre. Therefore, it is wrong to dub *Bhand Pather* as *Bhande Natyam* as no attempt has been made to draw a line of demarcation between the great and the little tradition. In every learned human society, elite and folk-art compositions go side by side with a distinct purpose to delight two distinct opposite shades of people : elite and commoners.

Popular approach to Kashmiri folk theatre in collecting as well as understanding it, so far has been preservative rather than appreciative and as such prescriptive rather than descriptive. In taking it as a repertoire of the relics of the past, the approach is a continuation of the earliest enthusiasm of the colonial times when the Orientalists of the West engaged themselves in collecting this forgotten treasure for its antiquarian value. However the folklorists who collected it and preserved it as a rich legacy merit commendation for saving its linguistic expression, craft and paraphernalia from vanishing into oblivion. It was Mohammad Subhan Bhagat (1927-1993), the eminent folk artist of Jammu and Kashmir who not only revived Kashmiri folk theatre, but also innovated in all its aspects. He wrote:

“So far as the question of survival of this folk art is concerned, I can say with confidence that the art has the potential to change and continue by accepting ever-new modes and hues of the ever changing times and assimilating them into its texture, nevertheless the survival of this folk art depends on the cooperation of the common folks whose representative it stands. In the past it thrived only because of the patronage of the Rajas, Maharajas and landlords. It is encouraging to note that in modern times too many people are showing their whole hearted love for it.”

(1979: 19-20)

The old oral form of the theatre, reminiscent of the medieval times is nowadays being forgotten, but it still has a tremendous scope because in modern times there is again a shift towards the native and the local. All the post-modernist theaters seek more and more inspiration from the native form, and, as such, *Bhand Pather*, has the scope of getting resuscitated and turned into a viable tool of both entertainment and instruction. *Gwaseen Pather* and *Shikaargah* to name only few are not dramatic representation of men and women of any historical past, but every one of every age. “The Maagum, the impresario”, “Maskhar the buffoon”, “Raazi, the king”, “Gwar” (the priest) and “Ashaaq”, the frivolous lover, “Gupeely”, the coquette and other characters in the known folk repertoires are not fixtures of past theatre, but represent everybody of all times. They effectively and pleasantly represent men and women with all their charms and incongruities, noble and ignoble manners and conduct. They are not characters determined by any set values, but by time. They change according to the social, economic and cultural context as such it is not ideal to foresee a *Bhand Pather* that shall represent men and women of the contemporary reality marked for its western manner of living. Craze for the hi-fi culture and IT corruption, disintegration of families, diaspora and loneliness are now universal. We can have a new type of pantomime like *angrez pather*, *Computer Pather*, *Mobile Pather* and what not. The fact is that the Bhand is not legacy of the medieval time. The Bhand is our instinct present in every one of us in all ages. The professional entertainers bring the Bhand talent in us to the fore and the resulting humor in the words of Schopenhauer detaches us, “from our world of good and evil” of loss and gain and enables us to see it in proper perspective. This fundamental purpose of the burlesque and laughter is best understood by the clowns of the a *Bhand Pather*. Here for instance is an expert from *Darzi Pather* (*Drama Dard-Tribe women*).

**Rest of the clowns:** Tell us something delectable.

**Clown-II:** But say something so spicy (pointing towards the ladies) that they too get thrilled. Do not tell us anything that will cause us hang our heads in shame.

**Elder Clown:** (Singing Rof in cahoots with ladies) Hai ransi Tomul Manah( O Dear! Prepare rice for us.).

The choristers play at wasool and the clown and the ladies dance in a ring and sing doggerel about rice.

**Dard:** (Coming behind amidst the din and holding Clown -II by the ear, tearing him away from the ladies) What are you doing?

(Tr. M.S. Beg, 1999, 855-6)

By combining comedy and satire, a typical *Bhand Pather* returns to modern man the euphoria of childhood. In all modern societies mankind is facing a terrible anxiety, fear and depression. The folk theatre can work as an antidote against this poison of modern living and give us, though momentarily the natural joy of the bygone times.

Being essentially a polyphonic theatre *Bhand Pather* is aimed at playfulness in mixing pantomime masquerade, drum beating, *shahanai* chants, dance and weird costume. The audience enjoys it spontaneously as they are free from the constraint of identification. The spectator inspite of the distance between the real and the theatricality is one with the players. In some performances of *Bhand Pather*, there is scope for the audience to become performers. The fundamental method of *Bhand Pather* is parody and juvenile instinct that for the adults get expressed in many art forms but in its complete form in the shape of folk drama. Since every folk performance deals with the present, it burlesques the men and women engaged in actual life situations. A *Bhand Pather* despite its set costumes and accoutrement explores the triviality and incongruities of human behaviour that is apparently very serious. By striking a balance between assumed seriousness and implicit triviality, frivolity and absurdity *Bhand Pather* makes his audiences conscious of his flaws and has been powerful medium of social transformation and has the potential of being a medium of mass education in times to come. In the past it has been the most popular and affective strategy of revolt against various social evils and exploitations and in the contemporary complex world when mankind is beset by numerous hazards like over population, AIDS, pollution, noise, joblessness and terror, one hopes that the *Bhand Pather* becomes a popular street theatre to bring out attitudinal education among the masses.

Like any another form of folk art, *Bhand Pather* is a congregational performing arts in which there is hardly any difference between the performers of the proscenium and the audience. Being inalienably linked with festivals and rituals, the art though purely secular is sacred. It is participatory in nature rather than objectively distanced. Nevertheless the producer and the artists have to bear in mind that they are not to present a facsimile of the existing social reality and thus involves artifice and skill as much as possible. The maestros in the genre knew it well. Now it is the turn of the inheritors of the tradition that they make it a complete art work which involves other art forms like music dance, song, martial arts, acrobatics, trickery, ploys and if necessary and possible even modern techniques like animation, laser beam effects and mirror props . In order to be aesthetically more presentable, *Bhand Pather* has to come out of its narrow thematic and technical boundaries and be open to borrowing from the performing arts of other communities. No art form can survive in isolation. It could easily imbibe good constituents of folk forms of art like Manipuri dance, Naga Mask Dance, Assam drum dance, Ghatak Dance of North India, Dhamaal of Punjab and also from the South Indian arts. It can also revive all the extinct performing arts of Kashmir like *Gatki Beezy*, *Damaalee Swarnay Wadan*, *Kanil Waan*, *Tamburi Nagma*, *Vigne Nachun*, *Garaayey* and *Ladiy Shah*. There have been many experiments to integrate all these types of entertainment into one unified form of art, a whole theatre, called *Bandhi Pather*.

For re-integrating *Bhand Pather* with the changing culture patterns of Kashmiri people, various institutions like Sangeet Natak Academy, State Cultural Academy, Indian National

Trust for Art and Cultural Heritage have to do whatever they can in making this legacy popular among the new generation. Contemporary generation in their inexorable stimulus hunt are getting dejected with stereotyped films and cheap television serials. *Bhand Pather* as an aesthetically presentable in terms of artists' accoutrement, costume and technique is sure to fill the gap and become an integral part of Kashmiri society.

An art can have a secure future only when its pursuers find it as a visible profession. Every art is essentially a profession, various theories of art notwithstanding. The practicing *Bhands* in spite of their significant role are still marginalized under privileged community. A *Bhand* of young generations is generally shy of showing allegiance to the class. What Sir Walter Lawrence wrote about the *Bhands* over one hundred and ten years ago is still relevant for the community. He wrote;

*The story of the Akungam Bhaggats is peculiar. Brahmanas considered acting to be degrading and even now the Brahmanas of Kashmir regarded the Akingam players with contempt. But the Brahman players say that they took to the stage by the express order of the goddess Devi. The legend relates that many years ago Devi appeared to the ancestor of the Akungam and placing fiddle in his hands said play upon this fiddle. He protested his inability but on the goddess persisting he took up the bow and played unearthly music. (1895:313)*

It is opportune time that we recognize the glory of *Bhand Pather* as a legacy of Kashmiri culture. There is tremendous possibility of integrating it with our cultural tourism. The tourists coming from other climes and lands are fed up with the artificial life and are always looking for something natural, indigenous, and the native. Let us hope that the roaming entertainers and educators associated with *Bhand Pather* once again throng into our village, modern urban halls, annual festivals and all tourist spots.

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# REVIEW AND COMPARISON OF CIRCLE AND PATTERN FORMATION METHODS OF SWARM AGENTS

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## ABSTRACT

*Swarm robotics is inspired by insects and their colony and is applied to solve real- world problems utilizing autonomous agents. Research in the field of swarm robotics has revealed the competency of such robot systems to assemble, inspect, disperse, aggregate and follow trails. Swarm robots are autonomous, self-sufficient, oblivious, memoryless robots and have very restricted capabilities .These can form simple patterns in the environment they inhabit. These simple patterns can be used by the robots to achieve some real-time or high-level tasks. In this paper, the focus is on finding the algorithm of circle formation of swarm robots. Relevant circle formation methods are reviewed and compared. The objective of this review is to provide an overview about circle formation using swarm robots, limitations and considerations on dealing with the swarm of robots.*

**Keywords:** Circle formation, multi agent system, pattern formation, swarm robots, Swarm robotics.

## INTRODUCTION

Multi-robot or swarm robotic systems consist of a large number of small and simple autonomous robots, each having limited communication/sensing capability and computational resources. Developing self-organising collective multi-robot systems has become an active research area in recent decades due to their attractive properties such as robustness to faults and damages, adaptability to unknown environments and cost efficiency [1]–[3]. Recent advances in robotics make it possible to build and operate a large number of inexpensive robots for various tasks beyond the scope of any single robots. Collaborative robot modelling and operations have been comprehensively explored in [4]. Others have taken the idea of using collaborative robots to find and track coherent structures in fluid which is a difficult problem since these structures are inherently unstable [5]–[9]. In addition, theoretical work on

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the use of collaborative robots in path planning has been investigated in [10], [11]. Specific applications for these multi-robot systems under consideration include, but are not limited to, collaborative search and rescue [12], [13], collective transportation and construction [14], [15], remote terrain/space exploration and mapping [16], deployment of sensor networks [17] and formation flying of micro-UAVs [18] and small satellites [19]. The individual unit or robot in a system of swarm robots is less expensive than a big robot. Increasing or decreasing the number of robots in this system involves very simple hardware or software modifications and thus provides good scalability. Moreover, having similar capability, if some robots fail, others can manage to execute the work. This feature makes the system to be more resilient to malfunction. In hostile environments, these robots are easily deployable to perform various complex tasks in cooperative fashion.

In particular, considerable interests have been paid to pattern formation allowing multi-robots to move in a loose or tight formation as a basic function for accomplishing a given mission. The pattern formation problem in multi-robot systems represents the coordination of a group of robots to generate and maintain a formation with a certain shape, in which the shape can be either a pre-defined pattern or adaptively formed in a self-organised way through local interactions with neighbouring robots and with the environment. In the former case of using pre-defined patterns, a group of autonomous robots shall follow a predefined trajectory while keeping a pre-specified spatial pattern and individual robots should maintain a specific relative orientation and distance between each other. In this pattern formation process, different control methodologies can be applied depending on the objectives. Leaders of the group may be selected to perform a higher level mission while the others follow the leaders in a specified way, or an entire group can be governed by a desired set of behaviours. Centralised pattern formation is possible when coordination is performed by a centralised unit that can overlook the entire group and control the individual robots accordingly. However, as robots generally have a limited communication and computation ability, global information is often not available to each robot, which makes the system less robust to failures and poorly scalable. Thus, when a large number of agents are involved, the design of the controller should be based on local information only, which is the main concept in decentralised and distributed systems.

Distributed self-organising systems are considered to be more robust to failures of individual robots in the group for the following reasons. Distributed multi-robot systems have an inherent redundancy since the same role is given to all individual robots without the explicit use of any pre-specified individuals. If some robots fail to perform their tasks well, get damaged or even become completely defect, their neighbours can compensate their roles [20]–[22]. On top of the above, self-organising robotic systems are more adaptable to environmental changes since each robot not only has its own sensors but also receives information from its neighbours. Another advantage is computational scalability [23], [24]. Since individual robots do not need global interactions, increasing the number of robots and scaling up the system hardly affect the computational complexity of the controller of individual robots. For self-organised adaptive pattern formation, global patterns should emerge resulting from local interactions between individual robots. This sort of emergent patterns can be often seen in ecosystems such as pattern in seashells and fishes [25], and bird flocking, ant colony and

fish schooling [26]– [29]. Also, it can be observed in biological findings about how cells self-organise into global patterns, for example, animal pigmentation. A key to understanding the emergence of complex pattern formation system is self-organisation. Self-organisation is a spontaneous process in which some form of global order or coordination emerges from local interactions between components in a fully decentralised or distributed way [2], [30]. Due to some important properties of self-organised systems (e.g., flexibility, scalability and robustness), self-organisation in nature has become one of the primary inspiration sources for self-organising mobile multi-robot systems [31].

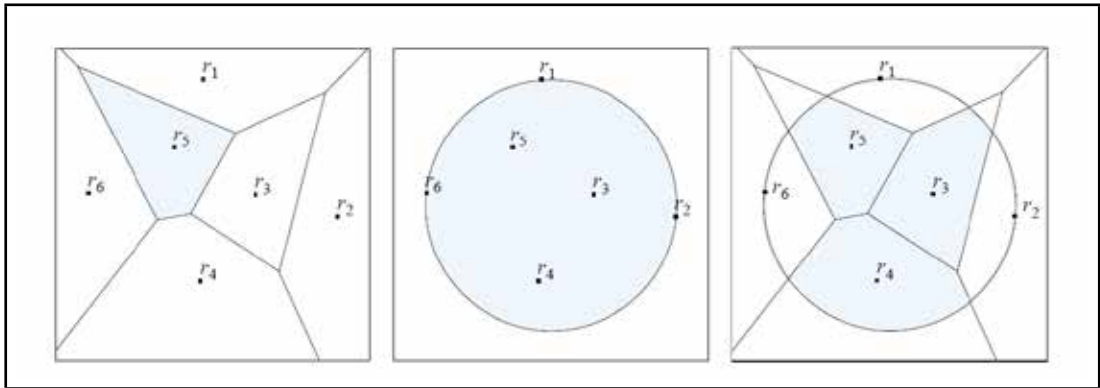
A fundamental problem in collective robotics is to have the group organize into global formations or patterns. These include simple patterns like circles, lines, uniform distribution within a circle or square, etc. In particular, we address the problem of circle formation by a group of mobile robots. The problem of circle formation has interesting applications. For instance, consider the context of space exploration and the initial preparation of a zone. A group of robots could be sent and after landing at random locations, would self-organize to form the initial infrastructure for later expeditions. Also, pattern formation is the first step towards flocking, i.e., allowing a group of robots to move in formation. Moreover, the formation of geometrical patterns and flocking are both useful in themselves for the self-positioning of mobile base stations in a mobile ad-hoc network and self-deployment of sensor rings.

## **CIRCLE FORMATION METHODS**

### **Smallest Enclosing Circle (SEC)**

i) Defago and Konagaya (2002) [32]: The authors try to make a circle from a randomly distributed colony of robots. The algorithm is based on Voronoi cells and Smallest Enclosing Circle (SEC). The smallest enclosing circle, as the name suggests, is the circle with the smallest radius enclosing all the robots. Each robot determines the boundary of the smallest enclosing circle and moves to that point. The authors state, “Although we believe that the algorithm could actually be used in practice, there are several important issues that must be addressed”. Each robot has to scan the positions of the rest of the colony and needs to make intensive computation to determine the SEC. Also, how the SEC can be practically determined in real time is not stated. In the circle formation algorithm, the robots are initially in arbitrary positions. The goal of these robots is to determine the *Smallest Enclosing Circle (SEC)* and then move to occupy positions along this circle. The SEC can be defined often by two, and at most three, external robots. Here the robots need to have sensing of the whole terrain. The robots can have their own local coordinate systems, and hence different views of the environment, but in the SEC, every robot compute for a given configuration of robots, and that will be same. However, the configuration of the robots changes as they move and hence it becomes necessary to ensure that the robots move in such a way that the SEC remains the same. To achieve this, the robots move according to certain rules based on Voronoi tessellation of the space around the robots [32]. Once all the robots take positions along the circumference of the SEC, the second algorithm is executed to spread the robots along the circumference. Every robot tries to move half the distance towards the mid-point of its nearest left and right robots. This method of circle formation is computationally complex because of the calculation of the Voronoi tessellation [32]. Each robot has to scan the positions of the rest of the colony

and needs to make intensive computation to determine the SEC. Also, how the SEC can be practically determined in real time is not stated.



**Figure 1: Voronoi Diagram and SEC**

This method consists of two algorithms executed one after the other. The first algorithm places the robots along the circumference of a circle and the second uniformly distributes the robots along the circumference.

ii) Chaudhuri, Ghike, Jain and Mukhopadhyaya (2014) [33] presents a deterministic algorithm for forming a given asymmetric pattern infinite time by a set of autonomous, homogeneous, oblivious mobile robots under the CORDA model. The robots are represented as points on the 2D plane. There is no explicit communication between the robots. The robots coordinate among themselves by observing the positions of the other robots on the plane. Initially all the robots are assumed to be stationary. The robots have local coordinate systems defined by Sense of Direction (SoD), orientation or chirality and scale. Initially the robots are in asymmetric configuration. This paper shows that these robots can form any given asymmetric pattern infinite time. In this paper, first using SEC method, non-uniform circle is formed and then using another algorithm robots form a uniform circle.

### **Merge then Circle**

Yun *et al.* (1997) [34] present a novel method for circle formation called the *Merge then Circle* algorithm. All the robots move initially towards the midpoint between their nearest and farthest robots. This, when executed for a long period of time, brings all the robots together in a cluster. After this step, the robots sense the positions of other robots and move in a direction of empty space for a distance equal to the radius of the desired circle. Once this is done, each robot uses the positions of its two nearest robots to move towards their midpoint for a more uniform distribution. In this paper the basic algorithm is divided into two stages: first converge all robots into a single cluster and then diverge them from the cluster to form a circle.

### **Using Positions of the Neighbouring Agents**

i) Michael, Andrew Mario (2004) [35] deals with the formation of a circle by a group of mobile agents (robots) that initially are randomly spread and randomly oriented in an

unmapped terrain. The agents have simple characteristics and limited capabilities. They are autonomous, homogeneous, anonymous, and memory-less. They do not communicate with each other, but are able to measure the inter-agent distances and angles. The agents follow the same distributed algorithm synchronously without any central control. The existing algorithms make it necessary to scan all the agents over the whole terrain. The main advantage of our algorithm is that each agent makes use of local information collected from two neighbouring partners. Our algorithm also results in a regularly distributed circle for any form of initial distribution. By changing a parameter in the algorithm, the circle can either be made to grow or shrink uniformly. This thesis tries to make a circle in an unknown terrain with autonomous mobile agents with only local sensing capability. An agent observes the positions of the neighbouring agents, one to its left and one to its right, computes the next position it has to be and moves there. The same iterative process of '*observe, calculate and move*' is simultaneously executed by all the agents in the colony till the colony forms a circle. The basic algorithm is that each agent tries to make the inter-agent angle equal to  $\theta$  where. To calculate  $\theta$  each agent has to know  $n$  and the total number of  $n$  agents in the colony.

ii) Mataric *et al.* [36-38] have also worked on maintaining formations for a small group of robots. In their work the robots have local sensing but through simple communication they have access to the global goal. The algorithm is developed by each robot keeping a designated friend at a particular distance and angle by using a panning camera. Each robot has a unique ID and a protocol for communication purposes

### **Use of a Beacon**

Cem Unsal (1993)[39] finds how the circle formation problem is rather trivialized by the use of a beacon around which the circle is to be formed. If the robots have a prior knowledge of the radius of the circle and by measuring the distance between themselves and the beacon and then by moving accordingly, circle can easily be formed. If there is a central beacon the terrain is no more unknown. The beacon itself serves as the origin of a coordinate system around which a circle of desired radius is formed.

### **Using Global Positioning System (GPS)**

Balch *et al.* [40-42], deal with the problem of keeping a formation and avoiding obstacles while in motion rather than shape formation of a randomly distributed colony. Keeping the shape of a line, column, diamond and wedge for a group of robots in motion is addressed. Moreover the robots are not considered to be homogeneous since each robot has an identification number. The Global Positioning System (GPS) is used to transmit the coordinates of the robot positions making the system not simple. The use of world coordinates with the help of GPS makes the terrain totally mapped.

### **Leader-Election and Group Assignment**

Karthikeyan Swaminathan and Ali A. Minai (2006)[43] discuss how the circle formation algorithm can be used as a means for solving other formation and organization problems in multi-robot systems. The idea behind this approach is that circle formation can be seen as a method of organizing the robots in a regular formation which can then be exploited.

This involves identifying specific robots to achieve different geometric patterns like lines, semicircles, triangles and squares, and dividing the robots into subgroups, which can then perform specific group-wise tasks. This paper explores the use of circle formation as a generic mechanism integrating both leader-election and subsequent group assignment in a reliable and efficient way. The algorithms that achieve these tasks are entirely distributed and do not need any manual intervention.

### **ZigBee communication protocol**

Anand. A, Nithya. M and Sudarshan (2014)[44] in their work explored a system to transfer an object from a random point to the destination using a swarm robotic system. A set of robots are coordinating to form a specific pattern around the object with step wise linear motion and are programmed to push the object from a source position to the destination in an obstacle free environment. Initially the robots are placed in known positions. ZigBee communication protocol is used for interaction among the robots. A single robot is chosen as a central coordinator and controls the movement of the rest of the robots in the swarm. Master bot decides on the path to be taken and also supplies the slave bots with the coordinates to be reached.

### **Gathering and Positioning**

Pilar, Fidel and Mireia (2016)[45] presented an algorithm that, from random positions, gathers all the agents in an established geometric formation. In this proposal, the user can determine the points that form the edges of the formation, so that the robots are positioned on the perimeter determined by the coordinates defined by the user. To ensure that the result is independent of the initial position of each robot, robots start at different random positions. As the algorithm is distributed, all agents have the same information and all are equipped with the same sensors; no leader is defined; there is no communication between them; they should avoid any collision; and obviously, two robots cannot take up the same position. This algorithm is fault-tolerant because although a robot does not reach the perimeter, the rest of the swarm is able to achieve the established geometric shape, so that the partial loss of an individual does not imply any problem in achieving the final goal. But the major problem with this algorithm is that it is not fault-tolerant if a fault occurs during some formed pattern. So it does not answer the question that what happens if a robot fails after forming a desired pattern? Whether the formed pattern would remain same, or change or destroy?

### **ADVANTAGES AND DISADVANTAGES OF CIRCLE FORMATION ALGORITHM**

Circle formation algorithms stated above have their own different advantages and disadvantages. The advantages of some algorithms presented are that they are simple and very little mathematical calculation is needed by each robot.

The main disadvantage of all the above algorithms is that each robot needs to scan the whole terrain for the functioning of the algorithm. By global scanning, each robot has to scan the positions of all the robots in the colony, store the information collected and make decisions depending on the stored information. Global scanning is disadvantageous for the following reasons:

1. The battery power of the robot will die off faster, since scanning the whole terrain needs

more energy. This will reduce the time period when the robot can function.

2. To attain global sensing it becomes necessary to have more powerful transmitters and sensors. This makes the robots sophisticated and not simple or weak.
3. If the number of robots ' $n$ ' is large, the robots need to have a memory array to store the positions of the robots. Then the robots have to sort them to select the closest or the farthest robot.
4. When ' $n$ ' is large, scanning the whole terrain is time consuming resulting in a delay at each iterative step. This reduces the efficiency of the colony as whole.

Another drawback in the past work is that they have not explained how each agent moves at each iteration. That is the direction and the distance that robot will make at each iteration, is not explained. In simulation, it is easy to find the location of the new position of the robot using the global coordinate system. In a practical situation of an unknown terrain, there is no such global coordinate system. A robot has to know how it will reach to a new position at each iteration. This decision making on how each robot has to travel is not clearly explained.

The other disadvantage is that the above algorithms do not always result in a circle. The outcome is dependent on the initial distribution. The circle formed is also not evenly distributed i.e. not uniform.

## COMPARISON OF CIRCLE FORMATION

This paper investigates the previous work performed on pattern formation and specifically on circle formation. Different methods of pattern and circle formation have been discussed in this paper using smallest enclosing circle, merge then circle, using positions of the neighbouring agents, use of a beacon, using Global Positioning System (GPS), leader-election and group assignment, Zigbee communication protocol, gathering and positioning. These methods differ in their methods used, assumptions, mathematical model, scheduling, visibility range, co-ordinate system, central/distributed control. Table 1 shows comparison of some circle formation methods based on scheduling, visibility range, agreement in co-ordinate and their results.

**Table 1: Comparison of Circle Formation**

Schedule	Visibility Range	Arrangement in co-ordinate	Results
Sync	Limited	No	Heuristic of approximate circle formation [SS1990]
Ssync	Unlimited	No	Circle formation [DK2002]
ASync	Unlimited	No	Bi-angular Circle formation [k2005]
ASync	Unlimited	No	Circle formation [DS2008]
Async	Unlimited	Agree in chirality	Uniform Circle formation by $n \neq 4$ robots [FGSV2014]

## CONCLUSION

This paper reviews and compares various methods of circle and pattern formation according to the methods used in their papers. Algorithms vary based on assumptions, mathematical model, central/distributed control, scheduling, visibility range, co-ordinate system and result. But the major problem with these various pattern formation algorithms is that they are not fault-tolerant (or reliable). It raises the question about reliability, robustness and fault tolerance in swarm robotics. It opens an area of research in fault tolerance in pattern formation of swarm robotics.

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# STATUS OF MIGRATORY BIRDS IN NEPAL: A CASE STUDY OF CHITWAN NATIONAL PARK

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## ABSTRACT

*The present study is concerned with the status of migratory birds in Chitwan National Park of Nepal. The study was carried out from April 2013 to March 2014. Total number of species of the birds observed in the study area was 161. Out of these, 121 were winter migratory birds belonging to 22 families, 26 were summer migratory birds belonging to 12 families and 14 were passage migrants belonging to 12 families. Most of the winter migratory birds were aquatic. Among them Ruddy Shelduck (*Tadorna ferruginea*) was the most abundant species. Most summer visitors breed at Chitwan National Park. Mainly fish-eating bird species were observed at river confluences and shaded forest areas. It was noted that migratory birds are decreasing in number due to several factors such as grass cutting in February-March, habitat loss, fishing, use of pesticides in agriculture, mass tourist activities in the park.*

**Keywords:** Chitwan National Park, Habitat, Migration, Passage Migrants, Season.

## INTRODUCTION

Nepal is greatly rich in avian fauna with a total of 871 species recorded in just about 200 years of modern ornithological research (DNPWC and Bird Conservation Nepal, 2012). The types of migratory birds of Nepal includes: (a) Permanent residents, (b) Summer migrants, (c) Winter migrants and (d) Passage migrants. With the end of the monsoon and the arrival of winter, huge numbers of migratory birds make their way towards Nepal, travelling hundreds of miles from their home regions. Towards the end of the monsoon, insects reproduce and serve as ample food for the birds. The migratory birds are important as they consume the excess insects to maintain the environmental balance. The varieties of migratory birds arrive in the lowlands of Himalayan region, mountain and Terai of their lakes, wetlands and riversides just

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to tide over the winter season. About 150 species of winter migratory birds arrive in Nepal from the countries of the higher northern latitudes viz., Russia, Kyrgyzstan, Turkistan, Uzbekistan, Azerbaijan, China, Mongolia, Eastern Europe, Korea, Siberia and Tibet. These flock in search of warmer and pleasant weather every winter. There are about hundred migratory species that transit through Nepal in their long range migrations from the countries of the higher northern latitude to Africa, Indonesia and Sri Lanka. Furthermore, in the rainy season thousands of birds migrate to Nepal for breeding every year (Bhushal, 2013).

The winter migratory birds come to the various wetland areas of Nepal viz., Koshi-Tappu Wildlife Reserve, Suklaphanta Wildlife Reserve, Chitwan National Park, Bishajari lake, Jagadishpur lake, Ghodaghodi lake as well as the Koshi, Gandaki, Karnali, Narayani rivers and their tributaries. The winter migratory birds start arriving in Nepal from October to November and upto March they begin to return to their home regions. Similarly, the time period from October to March is considered as the season of winter migratory birds. The birds which come to Nepal as winter migrants comprise mostly of Duck species and Raptors, the other species are Thrushes, Flycatchers, Leaf Warblers and Wagtails [Baral and Inskipp (2005), Bhushal (2013)].

Nepal is also one of the best destinations for the summer migratory birds due to favourable breeding environment. The summer migratory birds from southern parts of South-East Asia as well as from Africa and Australia come to Nepal from March to May and by the month of September they return to their native habitats after breeding. A total of 40 species of migratory birds visit Nepal every summer for breeding purposes. Different varieties of cuckoos are among the summer migratory birds which breed during their stay in Nepal. Other summer migrants are Chestnut-headed Bee-eater, Hooted Pitta, Asian Paradise-flycatcher. The main habitats of the summer migratory birds include the forests and adjoining grasslands (Bhushal, 2013).

The above trend shows the migration of birds in Nepal is an annual phenomenon which comprises both winter migrants as well as summer migrants. These migratory birds come to Nepal either directly or by stopping on the migratory routes. These birds take the help of position of the sun, stars, rivers, physical ranges and magnetic directions to reach their destinations. Amazingly, there are non-stop travellers who cover the entire journey within two days. They come here via the Kali Gandaki valley in the west and the Arun valley in the east. There are some special birds among migratory birds like Bar-headed Goose (*Anser indicus*) which fly over 9365 meter altitude, even higher than Mt. Everest and come to Nepal in winter season. Likewise, the summer migratory bird, Pied Cuckoo (*Clamator jacobinus*) comes to Nepal from African continent by travelling through a distance of around 5000 kilometers. Climate change has forced birds to change their migratory patterns. The destruction of wetlands, pollution of rivers and lakes, use of pesticides in agriculture and depletion of forest has led to dwindling of the bird populations (Bhushal, 2013).

The present study has been carried out with special reference to Chitwan National Park due to several reasons. First, in the recent years a little or no work has been done especially on status of migratory bird species in the area. Secondly, by the present study to find migratory status, more tourists will be attracted to visit the present site of study. Thirdly, due to physical

features viz; wetland, grassland and forested areas, especially riverine forest, migratory birds including winter and summer birds visit the area profusely.

## **STUDY AREA**

Chitwan National Park (27°30'N, 84°20'E) is the first National Park in Nepal established in 1973 (DNPWC, 2012). Chitwan National Park covers an area of 932 sq. km. and is located in south-central Nepal. UNESCO declared the park a World Heritage Site in 1984 and is also identified as an important bird area (IBA) by Bird Life International. Approximately, 70% of the park is covered by Sal forest, the remainder being grassland and riverine forests (Dinerstein, 2003). Chitwan National Park has many rivers and lakes. There are three major rivers: Narayani, Rapti and Reu. Major lakes are Bishazari Tal, Tamor Tal, Lami Tal, Garud Tal and Devi Tal. Chitwan National Park is the third most popular tourist destination in Nepal (Office of the Chitwan National Park, 2012).

## **MATERIALS AND METHODS**

The survey was carried out for 12 months from April 2013 to March 2014. The study was carried out in four strata viz; Balmiki Ashram to Temple Tiger, Temple Tiger to Kasara, Kasara to Sauraha, Sauraha to Sunachari in Chitwan National Park, during different seasons of the year 2013-2014. The researcher covered one kilometer at one time in each stratum for the purpose of observing the birds. Division of sites into different strata was based upon vegetation, types and habitats. Peak activity in most birds lasts for 1 or 2 hours after sunrise or before sunset. So time of observation of birds started from early morning and lasted till evening. Services of bird watchers were also hired for observation-information. Observation was done with 10x50 Super Zenith prismatic fields binocular from the Machan for over-viewing the grassland, generally with minimal disturbance to birds.

For winter water birds, survey was undertaken from a wooden dugout canoe, being used between 9hr and 17hr from 4-9 February 2013 (Khadka, 2012). Migratory water birds were observed using 10x50 DPS1 Olympus DPSR binoculars and photographs/videos were recorded through canoe powershot 5x40 HS. Survey was done in the Narayani and Rapti rivers including major lakes namely Garud Tal, Tamor Tal, Lami Tal and marshy land of Temple Tiger Lodge. The survey started from Sunachari, the eastern border of the park to Tribeni, the western border of the park.

Field visit to summer migratory birds were made from 14 February to 17 April 2013. The first part (14 February – 14 March) of the survey covered the eastern section of the park and the second half (16 March – 16 April) the western part of the park. Survey methods included direct observations of birds with the help of binoculars on seeing the birds, line transect method, habitat type, weather, bird population and activity of birds were recorded.

## **RESULTS AND DISCUSSION**

The current study recorded 121 winter migratory birds belonging to 22 families (Table 1), 26 summer migratory birds belonging to 12 families (Table 2) and 14 passage migrants belonging to 12 families (Table 3).

**Table 1: Winter Migratory Birds of Chitwan National Park**

<b>Family – Anatidae</b>		
<b>S.No.</b>	<b>English Name</b>	<b>Scientific Name</b>
1.	Greylag Goose	<i>Anser anser</i>
2.	Bar-headed Goose	<i>Anser indicus</i>
3.	Ruddy Shelduck	<i>Tadorna ferruginea</i>
4.	Common Shelduck	<i>Tadorna tadorna</i>
5.	Gadwall	<i>Anas strepera</i>
6.	Mallard	<i>Anas platyhynchos</i>
7.	Spot-billed Duck	<i>Anas poecilorhyncha</i>
8.	Northern Pintail	<i>Anas acuta</i>
9.	Red-crested Pochard	<i>Rhodonessa rufina</i>
10.	Common Merganser	<i>Mergus merganser</i>
<b>Family – Picidae</b>		
11.	Eurasian Wryneck	<i>Jynx torquilla</i>
<b>Family – Apodidae</b>		
12.	Himalayan Swiftlet	<i>Collocalia brevirostris</i>
13.	Alpine Swift	<i>Tachymarptis melba</i>
14.	Fork-tailed Swift	<i>Apus pacificus</i>
<b>Family – Columbidae</b>		
15.	Common Wood Pigeon	<i>Columba palumbus</i>
16.	Oriental Turtle Dove	<i>Streptopelia orientalis</i>
17.	Ashy-wood Pigeon	<i>Columba pulchricollis</i>
<b>Family – Gruidae</b>		
18.	Common Crane	<i>Grus grus</i>
<b>Family – Rallidae</b>		
19.	Purple Swamphe	<i>Porphyrio porphyrio</i>
20.	Common Moorhen	<i>Gallinula chloropus</i>
21.	Common Coot	<i>Fulica atra</i>
<b>Family – Scolopacidae</b>		
22.	Pin-tail Snipe	<i>Gallinago stenura</i>

23.	Common Snipe	<i>Gallinago gallinago</i>
24.	Jack Snipe	<i>Lymnocyrtus minimus</i>
25.	Whimbrel	<i>Numenius phaeopus</i>
26.	Eurasian Curlew	<i>Numenius arquata</i>
27.	Spotted Redshank	<i>Tringa erythropus</i>
28.	Common Redshank	<i>Tringa totanus</i>
29.	Wood Sandpiper	<i>Tringa glareola</i>
30.	Little Stint	<i>Calidris minuta</i>
31.	Temminck's Stint	<i>Calidris temminckii</i>
<b>Family – Charadriidae</b>		
32.	Pied Avocet	<i>Recurvirostra avosetta</i>
33.	Kentish Plover	<i>Charadrius alexandrinus</i>
34.	Northern Lapwing	<i>Vanellus vanellus</i>
35.	Grey-headed Lapwing	<i>Vanellus indicus</i>
<b>Family – Laridae</b>		
36.	Black-headed Gull	<i>Larus ridibundus</i>
37.	Brown-headed Gull	<i>Larus brunnicephalus</i>
<b>Family – Accipitridae</b>		
38.	White tailed Eagle	<i>Haliaeetus albicilla</i>
39.	Himalayan Griffon	<i>Gyps himalayensis</i>
40.	Eurasian Griffon	<i>Gyps fulvus</i>
41.	Cinereous Vulture	<i>Aegypius monachus</i>
42.	Short-toed Snake Eagle	<i>Circaetus gallicus</i>
43.	Black Eagle	<i>Ictinaetus malayensis</i>
44.	Eurasian Marsh Harrier	<i>Circus geruginosus</i>
45.	Pied Harrier	<i>Circus melanoleucos</i>
46.	Hen Harrier	<i>Circus cyaneus</i>
47.	Northern Goshawk	<i>Accipiter gentilis</i>
48.	Common Buzzard	<i>Buteo buteo</i>
49.	Long-legged Buzzard	<i>Buteo rufinus</i>
50.	Steppe Eagle	<i>Aquila nipalensis</i>

51.	Booted Eagle	<i>Hieraaetus pennatus</i>
<b>Family – Falconidae</b>		
52.	Common Kestrel	<i>Falco tinnun</i>
53.	Red-necked Falcon	<i>Falco chicquera</i>
54.	Eurasian Hobby	<i>Falco subbuteo</i>
55.	Oriental Hobby	<i>Falco severus</i>
56.	Peregrine Falcon	<i>Falco peregrinus</i>
<b>Family – Podicipedidae</b>		
57.	Great Crested Grebe	<i>Podiceps cristatus</i>
<b>Family – Phalacrocoracidae</b>		
58.	Great Cormorant	<i>Phalacrocorax carbo</i>
59.	Little Cormorant	<i>Phalacrocorax niger</i>
<b>Family – Ardeidae</b>		
60.	Grey Heron	<i>Ardea cinerea</i>
<b>Family – Ciconiidae</b>		
61.	Black Stork	<i>Ciconia nigra</i>
<b>Family – Laniidae</b>		
62.	Brown Shrike	<i>Lanius cristatus</i>
63.	Rufous-tailed Shrike	<i>Lanius isabellinus</i>
<b>Family – Corvidae</b>		
64.	Yellow-bellied Faintail	<i>Rhipidura hypoxantha</i>
65.	Long-tailed Minivet	<i>Pericrocotus ethologus</i>
66.	Maroon Oriole	<i>Oriolus traillii</i>
<b>Family – Muscicapidae</b>		
67.	Chestnut-bellied Rock Thrush	<i>Monticola rufiventris</i>
68.	Blue-capped Rock Thrush	<i>Monticola cinclorhyncha</i>
69.	Tickell's Thrush	<i>Turdus unicolor</i>
70.	Grey-winged Blackbird	<i>Turdus bouboul</i>
71.	Eurasian Blackbird	<i>Turdus merula</i>
72.	Dark-throated Thrush	<i>Turdus ruficollis</i>
73.	Kashmir Flycatcher	<i>Ficedula subrubra</i>

74.	Rusty-tailed Flycatcher	<i>Muscicapa ruficauda</i>
75.	Slaty-backed Flycatcher	<i>Ficedula hodgsonii</i>
76.	Pale Blue Flycatcher	<i>Cyornis unicolor</i>
77.	Asian Brown Flycatcher	<i>Muscicapa dauurica</i>
78.	Ultramarine Flycatcher	<i>Ficedula superciliaris</i>
79.	Verditer Flycatcher	<i>Eumyias thalassina</i>
80.	Blue-throated Flycatcher	<i>Cyornis rubeculoides</i>
81.	Siberian Rubythroat	<i>Luscinia calliope</i>
82.	White-tailed Rubythroat	<i>Luscinia pectoralis</i>
83.	Blue throat	<i>Luscinia svecica</i>
84.	Indian Blue Robin	<i>Luscinia brunnea</i>
85.	Black Redstart	<i>Phoenicurus ochruros</i>
86.	White-capped Water Redstart	<i>Chaimarrornis leucocephalus</i>
87.	Plumbeous Water Redstart	<i>Rhyacornis fuliginosus</i>
88.	Common Stonechat	<i>Saxicola torquata</i>
<b>Family – Sittidae</b>		
89.	Wallcreeper	<i>Tichodroma muraria</i>
<b>Family – Sylviidae</b>		
90.	Chestnut-crowned Bush Warbler	<i>Cettia major</i>
91.	Aberrant Bush Warbler	<i>Cettia flavolivacea</i>
92.	Grey-sided Bush Warbler	<i>Cettia brunnifrons</i>
93.	Spotted Bush Warbler	<i>Bradypterus thoracicus</i>
94.	Paddyfield Warbler	<i>Acrocephalus agricola</i>
95.	Blyth's Reed Warbler	<i>Acrocephalus dumetorum</i>
96.	Clamorous Reed Warbler	<i>Acrocephalus stentoreus</i>
97.	Thick-billed Warbler	<i>Acrocephalus aedon</i>
98.	Common Chiffchaff	<i>Phylloscopus collybite</i>
99.	Dusky Warbler	<i>Phylloscopus fuscatus</i>
100.	Smoky Warbler	<i>Phylloscopus fuligiventer</i>
101.	Tickell's Leaf Warbler	<i>Phylloscopus affinis</i>
102.	Western Crowned Warbler	<i>Phylloscopus occipitalis</i>

103.	Blyth's Leaf Warbler	<i>Phylloscopus reguloides</i>
104.	Lemon-rumped Warbler	<i>Phylloscopus chloronotus</i>
105.	Greenish Warbler	<i>Phylloscopus truchiloides</i>
106.	Hume's (Leaf) Warbler	<i>Phylloscopus humei</i>
107.	Large-billed Leaf Warbler	<i>Phylloscopus magnirostris</i>
108.	Golden-spectacled Warbler	<i>Seicercus burkii</i>
109.	Chestnut-crowned Warbler	<i>Seicercus castaniceps</i>
110.	Grey-hooded Warbler	<i>Seicercus xanthoschitos</i>
111.	Yellow-bellied Warbler	<i>Abroscopus superciliaris</i>
<b>Family – Passeridae</b>		
112.	Citrine Wagtail	<i>Motacilla citreola</i>
113.	Yellow Wagtail	<i>Motacilla flava</i>
114.	Grey Wagtail	<i>Motacilla cinerea</i>
115.	Olive-backed Pipit	<i>Anthus hodgsoni</i>
116.	Rosy Pipit	<i>Anthus roseatus</i>
117.	White-rumped Munia	<i>Lonchura striata</i>
118.	White Wagtail	<i>Motacilla alba</i>
<b>Family – Fringillidae</b>		
119.	Common Rosefinch	<i>Carpodacus erythrinus</i>
120.	Crested Bunting	<i>Melophus lathamii</i>
121.	Yellow-breasted Bunting	<i>Emberiza aureola</i>

In fairness, it may be added that inspite of keen observations, the following birds could not be seen during the study:

Falcated Duck, Common Pochard, Barred Cuckoo Dove, Eurasian Woodcock, Dunlin, Curlew Sandpiper, Ruff, Ibisbill, Pacific Golden Plover, Grey Plover, Yellow-legged Gull-Caspian Gull, Pallid Harrier, Lesser Kestrel, Laggar Falcon, Black-necked Stork, Southern Grey Shrike, White-browed Shortwing, Snowy-browed Flycatcher, Grey Bushchat, Common Starling, Pygmy Wren Babbler, Fire-breasted Flower-pecker, Eurasian Tree Sparrow.

**Table 2: Summer Migratory Birds of Chitwan National Park**

<b>Family – Coraciidae</b>		
<b>S.No.</b>	<b>English Name</b>	<b>Scientific Name</b>
1.	Dollarbird	<i>Eurystomus orientalis</i>
<b>Family – Meropidae</b>		
2.	Blue-tailed Bee-eater	<i>Merops philippinus</i>
3.	Chestnut –headed Bee-eater	<i>Merops leschenaulti</i>
<b>Family – Cuculidae</b>		
4.	Pied Cuckoo	<i>Clamator jacobinus</i>
5.	Chestnut-winged Cuckoo	<i>Clamator coromandus</i>
6.	Indian Cuckoo	<i>Cuculus micropterus</i>
7.	Eurasian Cuckoo	<i>Cuculus canorus</i>
8.	Oriental Cuckoo	<i>Cuculus orientalis</i>
9.	Grey-bellied Cuckoo	<i>Cacomantis passerinus</i>
10.	Plaintive Cuckoo	<i>Cacomantis merulinus</i>
11.	Drongo Cuckoo	<i>Surniculus lingubris</i>
12.	Asian Koel	<i>Eudynamys scolopacea</i>
<b>Family – Apodidae</b>		
13.	White-throated Needletail	<i>Hirundapus caudacutus</i>
<b>Family – Caprimulgidae</b>		
14.	Grey Nightjar	<i>Caprimulgus indicus</i>
15.	Indian Nightjar	<i>Caprimulgus asiaticus</i>
<b>Family – Rallidae</b>		
16.	Watercock	<i>Gallicrex cinerea</i>
<b>Family – Jacanidae</b>		
17.	Pheasant-tailed Jacana	<i>Hydrophasianus chirurgus</i>
<b>Family – Laridae</b>		
18.	Little Tern	<i>Sterna albifrons</i>
<b>Family – Ardeidae</b>		
19.	Yellow Bittern	<i>Ixobrychus sinensis</i>

Family – Pittidae		
20.	Hooded Pitta	<i>Pitta sordida</i>
21.	Indian Pitta	<i>Pitta brachyuran</i>
Family – Corvidae		
22.	Eurasian Golden Oriole	<i>Oriolus oriolus</i>
23.	Ashy Drongo	<i>Dicrurus leucocephaeus</i>
24.	Crow-billed Drongo	<i>Dicrurus annectans</i>
25.	Asian Paradise Flycatcher	<i>Terpsiphone paradisi</i>
Family – Muscicapidae		
26.	Orange-headed Thrush	<i>Zoothera citrina</i>

A total of 26 birds were seen from 12 families (Table 2).

In fairness, it may be added that following birds could not be observed by the present study besides best efforts.

Slaty-legged crane, Painted stork, Lesser Florican, Indian Skimmer, Sarus Crane, Black Baza.

**Table 3: Passage Migrants of Chitwan National Park**

Family – Gruidae		
S.	English Name	Scientific Name
1.	Demoiselle Crane	<i>Grus virgo</i>
Family - Rallidae		
2.	Slaty-breasted Rail	<i>Gallirallus striatus</i>
Family - Scolopacidae		
3.	Eurasian Woodcock	<i>Scolopax rusticola</i>
4.	Black-tailed Godwit	<i>Limosa limosa</i>
Family - Laridae		
5.	White-winged Tern	<i>Chlidonias leucopterus</i>
Family – Accipitridae		
6.	Upland Buzzard	<i>Buteo hemilasius</i>
Family – Ardeidae		
7.	Great Bittern	<i>Botarus stellaris</i>
Family – Thruskiornithidae		
8.	Eurasian Spoonbill	<i>Platalea leucorodia</i>

Family – Ciconiidae		
9.	White Stork	<i>Ciconia ciconia</i>
Family – Laniidae		
10.	Bay-backed Shrike	<i>Lanius vittatus</i>
Family – Hirundinidae		
11.	Sand Martin	<i>Riparia riparia</i>
Family - Sylviidae		
12.	Eurasia Woodcock	<i>Scolopax rusticola</i>
13.	Sulphur-bellied Warbler	<i>Phylloscopus griseolus</i>
Family - Passeridae		
14.	Tawny Pipit	<i>Anthus campestris</i>

In total, 14 birds were seen belonging to 12 families (Table 3).

In fairness, it may be added that the present researcher has not seen following three birds even after very careful and minute observations:

1. Sanderling
2. Dunlin
3. Bean Goose

Baral and Inskipp (2005) have reported that some birds are winter visitors, some are year-round residents and others just migrate on their way between India and temperate regions to the north or up to the mountain slopes.

This study noted that in Chitwan National Park, birds migrate from as far as Sri Lanka, South-East Asia, Mongolia, Eastern Europe and Africa to avoid seasonal changes and for breeding.

Baral and Upadhyay (2006) have mentioned 31 summer, 209 winter and 22 passage migrant birds in their checklist of birds of Chitwan National Park. Likewise, Bird Education Society and Department of National Parks and Wildlife Conservation (2013) have also listed 53 summer visitors, 168 winter visitors and 13 passage migrants. While the result of this study showed 121 were winter migratory birds, 26 were summer migratory birds and 14 were passage migrants. It is quite plausible that the earlier authors covered birds not only of Chitwan National Park but in the adjacent area also.

As mentioned, in the checklists provided by various authors following birds have not been observed during this study even after careful and minute observations:

**Summer Birds:** Slaty-legged crane, Painted stork, Lesser Florican, Indian Skimmer, Sarus Crane, Black Baza.

**Winter Birds:** Falcated Duck, Common Pochard, Barred Cuckoo Dove, Eurasian

Woodcock, Dunlin, Curlew Sandpiper, Ruff, Ibisbill, Pacific Golden Plover, Grey Plover, Yellow-legged Gull-Caspian Gull, Pallid Harrier, Lesser Kestrel, Laggar Falcon, Black-necked Stork, Southern Grey Shrike, White-browed Shortwing, Snowy-browed Flycatcher, Grey Bushchat, Common Starling, Pygmy Wren Babbler, Fire-breasted Flower-pecker, Eurasian Tree Sparrow.

**Passage Migrants:** Bean Goose, Sanderling, Dunlin.

This study also showed that the breeding potentiality of birds is decreasing due to change in grass cutting season in the Chitwan National Park. Earlier it was in the month of January while nowadays it has shifted to February and March which are the breeding season of birds. It effects badly on the behaviour of birds.

Mainly fish eating species were seen at river confluences and shaded forest areas. The higher concentration of fishes at confluences between the main river streams and various tributaries and creeks, may be a factor influencing the prevalence of water birds in such areas (Khadka, 2012 and 2013).

This study also showed that habitat disturbance and human interventions are the cause of decreasing number of migratory birds in the area. East part running across Amrite to Sunachuri at the Rapti River has poor security arrangements. Due to this, massive sand mining, grazing, fish poisoning, fishing through electric shock and other illegal activities frequently take place. These practices results in the reduction of number of fishes which results in decrease of the number of migratory birds since birds depend on fish for food. From Amrite to Rapti Narayani confluence where there is low disturbance, highest number of Ruddy Shelducks and several other aquatic birds including ducks, geese, plovers, pratincoles and storks were observed in good numbers.

The maximum observed species were Ruddy Shelducks because they feed on algae which are widely available at the banks of Rapti and Narayani rivers where water flow is slow. They also remain in pair within the flocks (Khadka, 2012 and 2013).

## CONCLUSIONS

Regarding the birds of Chitwan National Park and its immediate surroundings, it can be mentioned that total number of bird species are 625 (BES and DNPWC, 2013). In Chitwan National Park, there are higher number of birds visiting in winter. Summer visitors are relatively lesser in number. Few passage migrants are noted. Common winter migratory birds are Ruddy Shelduck (*Tadorna ferruginea*), Bar-headed Goose (*Anser indicus*), Common Merganser (*Mergus merganser*), Great Cormorant (*Phalacrocorax carbo*). Comparatively Ruddy Shelduck was the most abundant species. In Chitwan National Park winter migratory birds are mostly aquatic species.

Common summer migratory birds are mainly Grey-bellied Cuckoo (*Cacomantis passerinus*), Chestnut-headed Bee-eater (*Merops leschenaultia*), Asian Paradise-flycatcher (*Terpsiphone paradise*). Asian Koel (*Eudynamys scolopacea*) have been frequently observed.

Common passage migrants are very few like Demoiselle Crane (*Grus virgo*) and Sand Martin (*Riparia riparia*)

Migratory birds are becoming less in number due to habitat loss, use of pesticides in agriculture, use of chemicals in water, deforestation and encroachment, eutrophication, illegal hunting and trapping, illegal trade, climate change, industrialization, urbanization, mass tourist activities in park and disturbance in migratory corridor.

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## EDUCATIONAL REMEDIES FOR MINORITIES IN INDIA

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### ABSTRACT

*India is a country of tremendous diversities in every sphere of life. It is constitutionally a secular democracy with people of various faiths and religions. It is the duty of the Government of India to provide and safeguard the educational rights of the minorities. The present study aims to discuss the Constitutional provisions and the educational remedies implemented by the Government of India for the education of Minorities since independence and also policies and recommendations of various commissions and committees formed by the Government of India towards this issue of minority education.*

**Keywords:** Educational Remedies, Government of India, Minority, National Commission of Minority.

### INTRODUCTION

Mahatma Gandhiji has stated, “A civilization can be judged by the way it treats its minority.” Almost all states have one or more minority groups within their national territories, characterized by their own ethnic, cultural, linguistic and religious identity which differs from that of majority population. Meeting the aspirations of these groups and ensuring the rights of persons belonging to minorities only can acknowledge the dignity and equality of individuals. It is stated in the preamble of United Nations Declaration- “.....*The promotion and the protection of the rights of persons of belonging to national or ethnic and linguistic minorities contribute to the political and social stability of State in which they live.*”

The expression “Minority” has been derived from the Latin word ‘minor’ and with the suffix ‘ity’ which means ‘small in number’. According to *Encyclopedia Britannica*, ‘Minority’ means “group held together by ties of common descent, languages or religious faith and feeling different in these respect from the inhabitants of a given political entity.” J. A. Laponce

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describes minority “as a group of persons having different race, language, or religion from that of majority of inhabitants.”

India is a secular democratic nation, so the architects of Indian Constitution guaranteed to minorities all necessary rights and freedom, but nowhere defined the expression ‘Minority.’ The expression ‘Minority’ has been used in Article 29 and 30 of the constitution, but defined nowhere.

The Preamble of the Constitution proclaims to guarantee its every citizen ‘*Liberty of thought, expression, belief, faith and worship.*’ If the provisions of the Constitution are correctly read, only two types of minority i.e. religious and linguistic can be deduced. India is a land of diversities consisting of different religions with Hindus in majority. According to census 2011, the religious composition and literacy status of the population is given in the following Table-

**Table 1: Population groups in India (Census,2011)**

Community	Population (crores)	% of total Population	Literacy (Male)	Literacy (Female)	Total Literacy
<b>All India</b>	121	100.00	75.3	53.7	64.8
<b>Hindu</b>	96.63	79.80	76.2	53.2	65.1
<b>Muslims</b>	17.22	14.23	67.6	50.1	59.1
<b>Christians</b>	02.78	2.30	84.4	76.2	80.3
<b>Sikhs</b>	02.08	1.72	75.2	63.1	69.4
<b>Buddhists</b>	00.84	0.70	83.1	61.7	72.7
<b>Jains</b>	00.45	0.40	97.4	90.6	94.1
<b>Others</b>	00.79	0.70	60.8	33.2	47.0

The lowest literacy rate has been recorded at 47% for ‘other religions’. Muslims have a literacy rate of 59.1% which is lower than the national average literacy rate.

Education is one of the significant social indicators having bearing on the achievement in the growth of the individual as well as community. This is perceived to be highly suitable for providing employment and thereby improving the quality of life, the level of human well-being and access to basic social services. The Indian Muslims, the second largest community of India, is next only to the population of Indonesia. The economical and educational progress of minorities, especially of Muslims, which is backward in literacy rate, is therefore, very crucial for the progress of the country. No country can boast of its development, if it’s sizable minority lags behind; if a large part of its population remains illiterate and poor.

The Plan document of the XII Five Year Plan states, “Education is the single most important instrument for social and economic transformation. A well educated population, adequately equipped with knowledge and skill, not only essential to support economic growth, but is also pre-condition for growth to be inclusive since it is the educated and skilled person who can stand to benefit most from the employment opportunities which growth will provide.”

(Para 10.1 of the *Approach to the XII Five Year Plan.*)

## THE CONSTITUTIONAL REMEDIES

The framers of the Indian Constitution were keenly aware of the fact that minorities should have to be assured "*Liberty of thought, belief, faith and worship.*" The Founding Fathers of the Constitution tried to satisfy the hopes, aspirations, desires and rights of the minority by safeguarding the educational rights of minority. At the 5<sup>th</sup> session of the Constituent Assembly of India, the Chairman, Dr. Rajendra Prasad assured the Minorities in following terms:

*"To all the minorities in India we gave the assurance that they will receive fair and just treatment and there will be no discrimination in any form against them. The religion, their culture and their language are safe and they will enjoy all the rights and privileges of citizenship, and will be expected in their turn to render loyalties to the country in which they live and its constitution. To all we give assurance that it will be our endeavor to end poverty and squalor, hunger and disease, to establish distinction and exploitation and to ensure decent condition of living."*

*"The inspiring and nobly expressed preamble to our constitution records the solemn resolve of the people of India into a SOVERIGN DEMOCRATIC REPUBLIC and, amongst other things, to secure to all its citizens JUSTICE LIBERTY and EQUALITY and to promote among them all FRATERNITY assuring the dignity of the individual and the unity of the Nation."*

(In Kerala Education Bill, 1957, AIR 1958 SC p956 para5)

The assurance given by the Chairman of the Constituent Assembly and in the Preamble of Constitution has been reflected into specific provisions, significantly contained in Part III, the Chapter on Fundamental Rights. One of the most cherished objects of our Constitution is to assure to all its citizens the liberty of thought, expression, belief, faith and worship. This commitment has been implemented and fortified through certain specific provisions. Apart from Article 14 & 15 which guarantees equality and equal opportunities in matter of public employment respectively. Article 19(1) guarantee among other rights, the freedom of speech and expression; and the right to practice any profession or to carry on any occupation. Then, there are specific provisions for minority rights.

### **Article 29 –Protection of Interest of Minorities----**

(1) Any section of the citizens residing in the territory of India or any part, thereof having a distinct language, script or culture of its own, shall have the right to conserve the same.

(2) No citizen shall be denied admission into any educational institution maintained by the State or receiving aid out of the State fund, on the ground only of religion, race, caste, language or any of them.

### **Article 30- Right of Minorities to establish or administer educational institution-**

(1) All Minorities, whether based on religion or language shall have the right to establish and administer educational institution of their choice.

(2) The state shall not, in granting aid to educational institution on the ground that it is under the management of minority whether based on religion or language.

Beside these, Article 350A says provides “*facilities for instruction in mother tongue at primary stage.*” Article 350B provides “*special offers for linguistic minorities.*”

Apart from rights and privileges guaranteed by the Constitution, the Indian government has also provided several statutory safeguards. Some of those are delineated below:

### **National Commission for Minorities**

The Indian Parliament on the 17<sup>th</sup> May, 1992, passed the National Commission for Minorities Act, ordering the Central Government to constitute a body, called The National Commission for Minorities. With the enactment of the National Commission for Minorities Act, 1992, the Minority Commission become a statutory body and renamed as National Commission for Minority. The first statutory National Commission was set up on 17<sup>th</sup> May, 1993, vide a Gazette Notification issued on 23<sup>rd</sup> October, 1993 by Ministry of Human Welfare, Government of India, five religious communities viz.; the Muslims, Christians, Sikhs, Buddhists and Zoroastrian (Parses) were notified as minority communities.

### **Functions of National Commission for Minority (NCM)**

As per section 9(1) of the NCM Act, 1992, the Commission is required to perform the following functions--

- (a) Evaluation of the progress of the development of Minority under Centre and States;
- (b) Monitoring of the work of safeguards for Minorities provided in the Constitution of India;
- (c) Making recommendations for the effective implementation of safeguards;
- (d) Looking into the specific complaints regarding deprivation of the rights and safeguards of minorities;
- (e) Conducting research, studies and analysis on socio-economic problems of minorities;
- (f) Suggesting appropriate measures in respect of minorities to the Government;
- (g) Making periodical and specific reports to the Central Government on any matter pertaining to minorities.

### **National Commission for Minority Educational Institutions Act, 2004:**

The National Commission for Minority Educational Institutions Act is the outcome of the UPA Government’s Manifesto that is called ‘National Common Minimum Programme.’ In the NCMP, in its section on “National Harmony, Welfare of Minorities,” it was mentioned that a commission for minority educational institutions will be establish. This is the first time that a specific commission has been made for protecting and safeguarding the rights of minorities to establish and administer educational institution of their choice (Article 30). This Commission is a quasi-judicial body and has been endowed with the powers of civil court. It is headed by a chairman, who has been a judge of the Delhi High Court and to members to be nominated by the Government of India. The Commission has three roles namely: adjudicatory function, advisory function and recommendatory function. So far the affiliation of a minority educational institution to a university is concerned; the decision of the commission would be final.

**Functions of NCMEI:**

The commission will accomplish the following functions-

- (a) Advise Central and State Governments on any question relating to the education of minorities, referred to it;
- (b) Enquire, *suo motu* or on a petition presented to it by any minority institution or any person regarding to the deprivation or violation of rights of minorities to establish or administer educational institution;
- (c) Intervene in any proceeding involving any deprivation or violation of the educational rights of minorities before a court;
- (d) Review the safeguards provided by or under the Constitution, or any law for the time being in force;
- (e) Specify measures to promote and preserve the minority status and character of institutions of their choice established by minorities;
- (f) Decide all questions relating to the status of any institution as minority educational institution and declare its status;
- (g) Make recommendations to the Government for appropriate and effective implementation of programmes and schemes relating to the minority educational institutions.

**National Monitoring Committee for Minorities' Education:**

National Monitoring Committee for Minorities' Education (NMCME) has been reconstituted by Ministry of Human Resource Development on 23<sup>rd</sup> December, 2011 by a resolution. The first meeting of the reconstituted committee was held on March 5, 2012 at New Delhi. In this meeting, a decision was taken to constitute a standing committee of NMCME and five sub-committees of NMCME were formed with purposes as follows—

- I. Implementation of Schemes Aimed at Minorities.
- II. Mapping of Educational Requirements of Minority- Region and District wise.
- III. Vocational Education and Skill Development of Minorities.
- IV. Girls Education.
- V. Promotion of Urdu Language and to enhance compatibility among Minorities through knowledge of English.

**Prime Minister's 15 Points Programme for Minorities**

The President of India in his address to the Joint Session of Parliament on February 25, 2005, announced that the Government would recast the 15 Point Programme for the welfare of Minorities with a view to incorporate programme specific interventions. Prime Minister in his address on the occasion of Independence Day, 2005, announced *inter-alia* that "We will also revise and revamp the 15 Point Programme that will have definite goals which are to be achieved in a specific time frame."

In pursuance of these commitments, the earlier Programme was revised as the Prime-

Minister's 15 Point Programme for the welfare of the Minorities. The educational objectives, included in the Programme under Part A with different schemes materialized by the Government, are as follows-

- a) Equitable availability of ICDS Services –which aimed at holistic development of children and pregnant or lactating mothers through Anganwadi centers.
- b) Improving access to school education under the Sarva Shiksha Abhiyan, the Kasturba Gandhi Balika Vidyalaya Scheme and other Government Schemes.
- c) Greater Resources for Teaching Urdu: Central assistance for recruitment and posting Urdu teachers at primary and upper primary school will be provided.
- d) Modernizing Madarsa Education: Central Plan of Area Intensive and Madarsa Modernization Programme.
- e) Scholarship for Meritorious Students from Minority Communities: Schemes for pre-matric and post-matric scholarships for Minority Communities will be formulated and implemented.
- f) Improving Educational Infrastructure through Maulana Azad Educational Foundation (MAEF): Government will provide all possible assistance to MAEF to strength and enable it to extend its activities more effectively.

#### **Sachar Committee for Minority:**

The Prime-Minister of India, on March 9, 2005, issued a notification for constitution of High Level Committee to prepare report on the social, economic and educational status of the Muslim Community of India. This seven member committee, under the chairmanship of Justice Rajinder Sachar, submitted its final report to the Prime-Minister on November 30, 2006. The Committee's mandate is to –

- a) Obtain relevant information and conduct a literature survey on the relative social, economic and educational status of Muslims in India at the State, regional and district;
- b) Determine the level of their socio-economic development;
- c) Determine the relative share in public and private sector employment;
- d) Determine the proportion of OBC's from Muslim community in total OBC population in various States;
- e) Determine access to education and health services etc. provided by government/public sector entities.

The key findings of the committee are:

- a) **Population:** The Report states, "in India, population of all major religions have experienced a large growth in the recent past, but the growth among Muslims has been higher than average."
- b) **Educational Conditions:** The literacy rate among Muslims in 2001 was 59.1% below the national average (64.8%). The Report also noted that a large number of Muslim children

attended Madarsas for primary diploma holders, while only 4% among the Muslim population were graduates and diploma holders.

- c) **Economy and Employment:** According to the report, the overall population of Muslims in Central Government departments and agencies is abysmally low at all levels.
- d) The committee reports that access to Bank credit is low and inadequate.
- e) **Access to Social and Physical Infrastructure:** The committee highlighted the following points-
  - I. About one third of the small villages with high concentration of Muslims do not have any educational institution.
  - II. About 40% of the large villages with a substantial Muslim concentration do not have any medical facilities.

### **Main Recommendations of the Committee:**

To improve the conditions of the Muslims, the committee made a number of recommendations including the following---

- a. Set up an Equal Opportunity Commission to look into grievances of deprived groups like minorities;
- b. Create a nomination procedure to the participation of minorities in public bodies;
- c. Encourage the UGC to evolve a system where part of allocation to colleges and universities is linked to diversities in population;
- d. Facilitate admissions to the most backward minorities in regular universities and autonomous colleges;
- e. Recognize degrees from Madrasas for eligibility in defence and banking examinations;
- f. Providing hostel facilities to minority students at a reasonable cost;
- g. Open high quality Urdu medium schools and ensuring high quality text books for students in Urdu language.

### **Policies of the Government for Welfare of Minorities**

On July 16, 2014, Press Information Bureau, Ministry of Minority Affairs, Government of India released a '*Policy for Welfare for Minorities.*' The Government has accelerated the pace of welfare of six notified minorities including the implementation of the existing schemes. The thrust area of the Government is skilling of minority youths and their placement and also preservation of heritage of minorities including promotions of their traditional arts and crafts. These schemes and programmes are being reviewed and restructured in accordance with the policies of the Government. The details of the steps taken by the Government for welfare of the minorities are-

- a) **USTAAD:** The scheme of upgrading skills and training in preservation of traditional ancestral arts and crafts.
- b) **Hamari Dharohar:** The scheme aims to preserve the rich heritage of Minority communi-

ties in context of Indian culture.

- c) **Khawaza Garib Senior Secondary School:** This will be set up at Ajmer by MAEF to give a flip to secondary education.
- d) **Nai Manzil:** A course to bridge the academic and skill development gaps of the *Deeni* madarsas pass outs with their mainstream counterparts.
- e) Strengthen the State Wakf Boards.

Some of the steps taken by the Government of India for educational welfare of the minorities also include:

- I. Multi-Sectoral Development Programme (MSDP).
- II. Pre-Matric Scholarship Scheme.
- III. Post-Matric Scholarship Scheme.
- IV. Maulana Azad National Fellowship for Minority Students.
- V. Merit cum Means based Scholarships.
- VI. Free Coaching and Allied Schemes.
- VII. National Minority Development and Finance Corporation (NMDFC).
- VIII. Grant in aid to MAEF.
- IX. *Seekho aur Kamao* Scheme for skill development.
- X. Nalanda Project: A pilot project for development of faculties of Minority colleges and higher educational institutions.
- XI. Magazine "*Minority Today*."

Thus, India, being constitutionally a secular, democratic State has implemented a lot of remedies for the better progress and development of its minorities without any discrimination. It is always an exercise in nation-building when State strengthens each and every citizen of India educationally, to make India politically and economically a global superpower.

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## **CANCER MORTALITY IN SRINAGAR CITY: A GEOGRAPHICAL ANALYSIS**

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### **ABSTRACT**

*The present study was an attempt to analyze cancer mortality in Srinagar city. Analysis of data reveals that the cancer mortality rate among Kashmiris had increased due to some leading behavioral and dietary risks. There is an alarming increase in cancers. The present study shows that the total cancer patients registered in the cancer death registry were 600 (2006–2016), of which 389 (64.83%) were males and 211 (35.16%) were females. Overall male to female ratio was 2: 1.1. Male deaths were more prevalent than female deaths in case of lung cancer & GIT cancer. Age group of 41-60 accounts for about 44% of the total mortality. Within this age group, around 85 patients died due to lung cancer (32.1%) followed by others (21.5%), GIT (18.5%), blood (15.1%), breast (7.5%) and ovarian (4.95).*

**Keywords:** Cancer, Disease, gender, mortality, nutrition, Srinagar.

### **INTRODUCTION**

Cancer may be regarded as a group of diseases characterized by an abnormal growth of cells, ability to invade adjacent tissues and even distant organs and eventual death of the effected patient if the tumor has progressed beyond that stage when it can be successfully removed (Park, 2011). Cancer which was a second ranking disease after heart disease as a killer has surpassed the heart disease and is now the number of one killer (WHO, 2010). Cancer is multi causal process; various risk factors include *inter-alia*, physical environment (climate, soil and water) and socio-cultural (individual behaviour, lifestyle, food habits,

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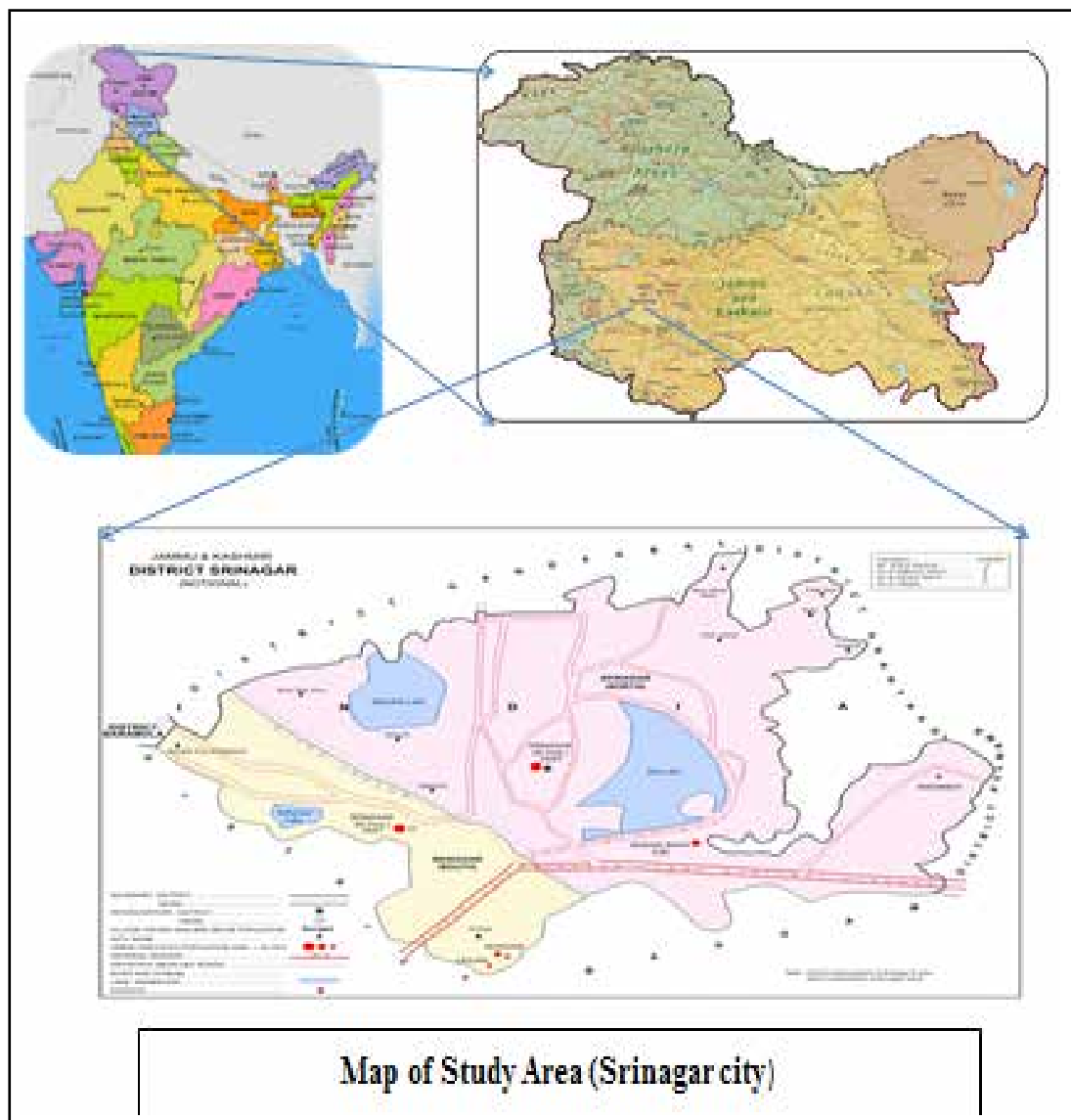
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alcohol, tobacco consumption, hygiene and occupation). Nearly 80% of all human cancers are environmental in origin (Harris, 1970), while 10% - 20% of all human cancers may be associated with dietary factors (Doll and Peto, 1981). Metals and metalloids such as Ar, Cd, Cr, Nr and Sc found in varied diets have been reported carcinogenic (I.A.R.C, 1982). Cancer sites varies from country to country depending on the development; liver and esophagus cancers are most common in third world countries, while lung cancer is most common in developed countries. Several cancer sites are linked with diet composition; colon cancer have been associated with low fiber intake; breast and prostate cancers has been related to western diets while high salted food have been associated with stomach cancer. Important cancer regions in India have been associated with physical, biological, socio-economic and cultural factors (Akhtar, 1978).

Increasing incidence of cancer mortality with considerable variation in different types of cancers in different areas with different physical & socio-economic setup (Akther & Rather 1998-2000). Kashmir is witnessing a surge in the number of cases in the past few years with lung cancer topping the list. The cancer mortality rate among Kashmiris have increased due to some leading behavioral and dietary risks, including high body mass index, low fruit and vegetable intake, lack of physical activity, tobacco use and lack of regular check-up. The changing life style and food habits among the inhabitants of Valley had caused surge in all the cancers especially in oesophagus, colon and breast cancers. There is an alarming increase in cancer incidence in Kashmir (Nazir *et al.*, 2016). World is facing an epidemic of non-communicable diseases and it is believed to get worse by the end of this decade. Non-communicable diseases are responsible for more than three-fifths of the deaths globally (36 million), largely contributed by cardiovascular diseases (48% of non-communicable disease deaths), cancers (21% of non-communicable disease deaths), chronic respiratory diseases (4.2 million deaths), and Diabetes mellitus (1.3 million deaths) It is predicted that cancer will be an important cause of mortality and morbidity all over the world in next few decades (Mariya *et al.*, 2016)

## AREA OF STUDY

Srinagar city lies between 33°59'14"N to 34°12'37"N latitude and 74°41'06" E to 74°57'27"E longitude. It is spread over 234.46 sq. km (Municipal limit) areas. It extends from Alestang in the north to Humhama in the south and Lawaypora in the west to Khanmou in the southeast. The city is located on both sides of the river Jhelum (a tributary of river Indus) locally called Vyeth in Kashmir. City about midway from either end of the valley, to the west of a spur which protrudes down from the chain of mountains forms its northern boundary. The physiographic setting of Srinagar city is characterized with low lying agricultural fields in the flood plain of river Jhelum in south and west. It has steep hills in the east and north east and the famous Karewa hills (locally called as Wudars) in far southeast. Karewas are flat and fertile agricultural mounds on the border of the Jhelum flood plain. These mounds flank the surrounding mountain precipice and are reminiscent of an earlier phase of intensive deposition. Their initial platforms have since been eroded and dissected into isolated uplands. They are believed to have been formed during the Miocene orogeny (Pal and Srivastava, 1982)



**Figure 1: Map of Srinagar City**

## LITERATURE REVIEW

Ayub, Ayub, Khan, Rasool, Mahboob-ul-Hussain, Wani, Kuchay, Lone, Andrabi (2011) made study on “*Epidemiological Distribution and Incidence of Different Cancers in Kashmir Valley 2002-2006*”. The study reveals that esophagus is the leading site of cancer in both sexes, followed by lung, brain, head and neck in males and breast and rectum in females. The incidence of cervical cancer in females and prostate cancer in males is lower in Kashmir as compared to Indian registries.

Pandith, Siddiqi (2012 ) made study on “*Burden of Cancer in the Valley of Kashmir.*” The study reveals that stomach cancer is the leading one with an average frequency of 19.2% followed by esophagus and lung as 16.5% and 14.6% respectively. Stomach (23%) and lung (21%) are the leading cancer sites among men while esophagus cancer (18.3%) tops among women followed by breast cancer (16.6%). Kashmir is a very high risk area of most commonly occurring cancers particularly cancers of gastrointestinal tract.

Wani, Jan, Khan, Pandita, Khurshid, Khan (2014) made study on “*Cancer Trends in Kashmir; Common types, Site Incidence and Demographic Profiles: National Cancer Registry 2000-2012*”. The study shows that cancer of esophagus, stomach and lungs have a high incidence both in men and women in Kashmir. The study reveals that overall incidence of cancer in Kashmir shows an increasing trend and number of cancer diagnosed is expected to double between the periods of 2012 to 2027.

Dhar, Shah, Naheed, Hafiza (1993) made study on “*Epidemiological trend in the Distribution of Cancer in Kashmir Valley*”. The study reveals that cancer of esophagus was the most frequent type in both sexes, accounting for 42.9% of all types of cancers in the valley. The preponderance of esophagus cancer was attributable to the local practice of drinking hot salt tea.

Rasool, Ganai, Syed, Masoodi (2012) made study on “*Esophageal Cancer: Associated Factors with special reference to the Kashmir valley*”. The study shows that esophageal cancer is a multifactorial disease and no single agent has been identified so far as the sole cause of cancer. High incidence in Kashmir have been associated with the consumption of hot salted tea, sun-dried, smoked food, tobacco in the form of hukkah and various genetic factors.

Qureshi, Masoodi Kadla, Sheikh, Gangadaran (2011) made study on “*Gastric Cancer in Kashmir*”. The study reveals that gastric cancer has been reported to be highly prevalent malignancy in Kashmir. Particular life style habits like consumption of salted tea and tobacco smoking by hukkah as well as *Helicobacter pylori* infection are main risk factors

## METHODOLOGY

The study is based on secondary data. Mortality data for different types of cancers prevailing in the study area was collected from Sher-i-Kashmir Institute of Medical Science (SKIMS) which is the specialized medical institution catering to cancer patients either directly or referred by hospitals of lower level throughout the valley. In the present study, an effort has been made to project the mortality rate of various cancer patients being treated in SKIMS Soura between 2007 -2016. After permission from ethics committee, data was collected from the said hospital. The present study is probably the first study of its kind which has depicted the true caseload of cancer being handled in SKIMS hospital

## RESEARCH HIGHLIGHTS

- Deeper insight into the data collected as above will open new avenues for research in cancer study & diagnosis to help develop more effective therapies;

- Evidence-based strategies for cancer prevention and early detection and management of the disease can go a long way in reducing the incidence of the dreaded disease.

## RESULT & DISCUSSION

Cancer has emerged as a major health threat across the world; Srinagar city is witnessing a surge in the number of cases in the past few years with lung cancer topping the list. According to official data available at Regional Cancer Centre, Sher-i- Kashmir Institute of Medical Sciences, Soura, the number of registered patients has shown an alarming increase during past few years; around 600 people have died due to cancer in Srinagar city. Lung cancer was the most commonly encountered cancer (27.8%) followed by other cancer (22%), GIT (21.1%), blood (18.8%), breast cancer (6.8%) and ovary cancer (3.3%).

There exists marked variation in mortality from cancers among the different medical blocks of Srinagar city. Highest mortality from cancers was reported from the Batamaloo area where, it was noted, 28.5% of total death was caused due to cancer. Mortality was also high in the medical block Khanyar (26.1%) and Zadibal (20.5%). Low mortality was noted from the medical block S.R.Gung & Hazratbal where number of deaths due to cancer was 13.6% and 11.1% respectively. Srinagar city has the largest urban concentration in the valley with modern life style. Urban life style, unhealthy diet etc may be encouraging the cancer incidences. Variations in mortality due to different types of cancers are also noted between medical blocks of Srinagar city. Lung cancer with a mortality of 30.5% to the total cancer death was most dominant in Khanyar area of Srinagar city. GIT cancer (23.5%) was first ranking cancer in Khanyar, breast cancer (9.94%) in Batamaloo, and ovarian cancer (4.06%) in Zadibal area. Blood & other types of cancers have recorded high mortality in Batamaloo medical block. Lung cancer is the leading cancer reported overall (27.8%). The reason for this may be due to the fact that use of tobacco in different forms like cigarette smoking, hukka, also known as hubble bubble and snuff is quite prevalent in the city.

Mortality from cancer exhibited an annual increasing trend between 2007 to 2016. During 2007, there were total of 9 deaths from cancer & it increased to 47 during 2016 (Table 1). Annual increase in cancer mortality displays variation from 2008 to 2012 and there was a rapid decrease in cancer mortality in the year 2013. Highest rate of cancer mortality was in the year of 2014. Mortality from the lung cancer has increased from 22.2% in 2007 to 38.2% in 2016, while mortality from breast cancer has declined from 11.1% in 2007 to 2.1% in 2016. Other types of cancers have witnessed an increasing trend but with fluctuations.

Table 2 clearly shows that high incidence of lung cancer was found in the month of January (31.8%) whereas least incidence were found in the month of September (13.5%). The mortality rate of GIT cancer was high in the month of March (33.3%) & least in the month of August (10.2%). Similarly for blood, breast, ovary, and other cancers; the high incidences were in the month of April (25.6%), March (12.6%), April (6.7%), April (21.6%) & no or low incidences in the month of May, Nov (16.1%), June (2.23%), May, July, Aug, Nov (0%), & Dec (15.9%) respectively (Figure 2).

**Table 1: Cancer Mortality Srinagar City by Year (2007-2016)**

(Number of Registered Deaths with % to Total)

<b>Year</b>	<b>Lung Cancer</b>	<b>GIT Cancer</b>	<b>Breast Cancer</b>	<b>Ovary Cancer</b>	<b>Blood Cancer</b>	<b>Other Cancer</b>	<b>Total</b>
<b>2007</b>	02 (22.2)	02 (22.2)	01 (11.1)	01 (11.1)	01 (11.1)	02 (22.2)	09 (1.5)
<b>2008</b>	10 (21.7)	08 (17.3)	07 (15.2)	02 (4.3)	08 (17.3)	11 (23.9)	46 (7.6)
<b>2009</b>	23 (27.0)	16 (18.8)	04 (4.7)	02 (2.35)	12 (14.1)	28 (32.9)	85 (14.1)
<b>2010</b>	24 (32)	19 (25.3)	04 (5.3)	04 (5.3)	10 (13.3)	14 (18.6)	75 (12.5)
<b>2011</b>	19 (30.6)	10 (16.1)	04 (6.4)	01 (1.61)	16 (25.8)	12 (19.3)	62 (10.3)
<b>2012</b>	17 (22.0)	16 (20..7)	04 (5.1)	02 (2.5)	14 (18.1)	24 (31.1)	77 (12.8)
<b>2013</b>	12 (31.5)	08 (21.0)	01 (2.6)	01 (2.6)	05 (13.1)	11 (28.9)	38 (6.3)
<b>2014</b>	23 (22.3)	22 (21.3)	11 (10.6)	05 (4.8)	33 (32.0)	09 (8.7)	103 (17.1)
<b>2015</b>	19 (32.7)	08 (13.7)	04 (6.8)	00 (0)	11 (18.9)	16 (27.5)	58 (9.6)
<b>2016</b>	18 (38.2)	18 (38.2)	01 (2.1)	02 (4.2)	03 (6.3)	05 (10.6)	47 (7.8)
<b>Total</b>	<b>167 (27.8)</b>	<b>127 (21.1)</b>	<b>41 (6.8)</b>	<b>20 (3.3)</b>	<b>113 (18.8)</b>	<b>13 (22)</b>	<b>600</b>

**Source:** SKIMS Soura, 2017

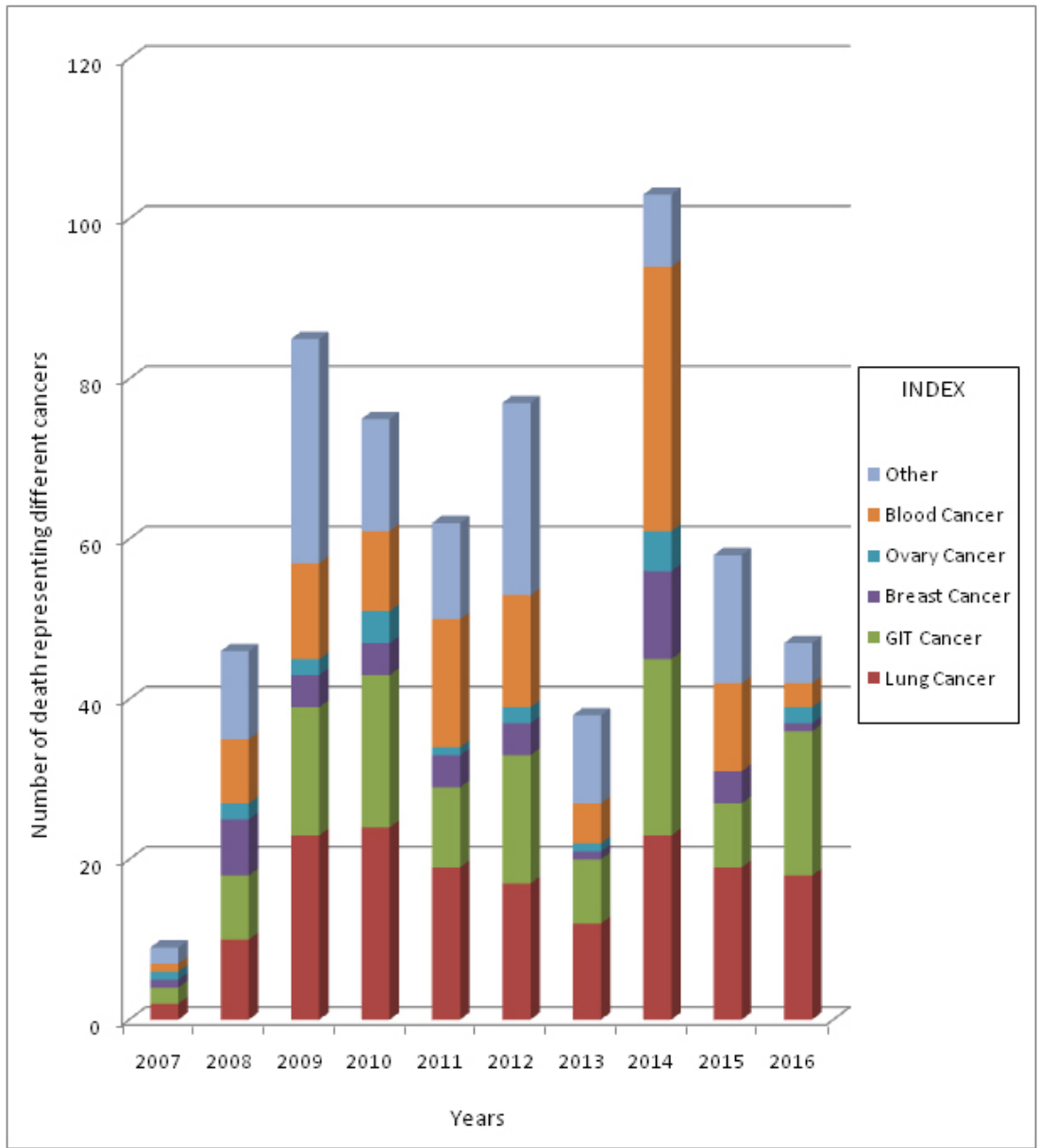


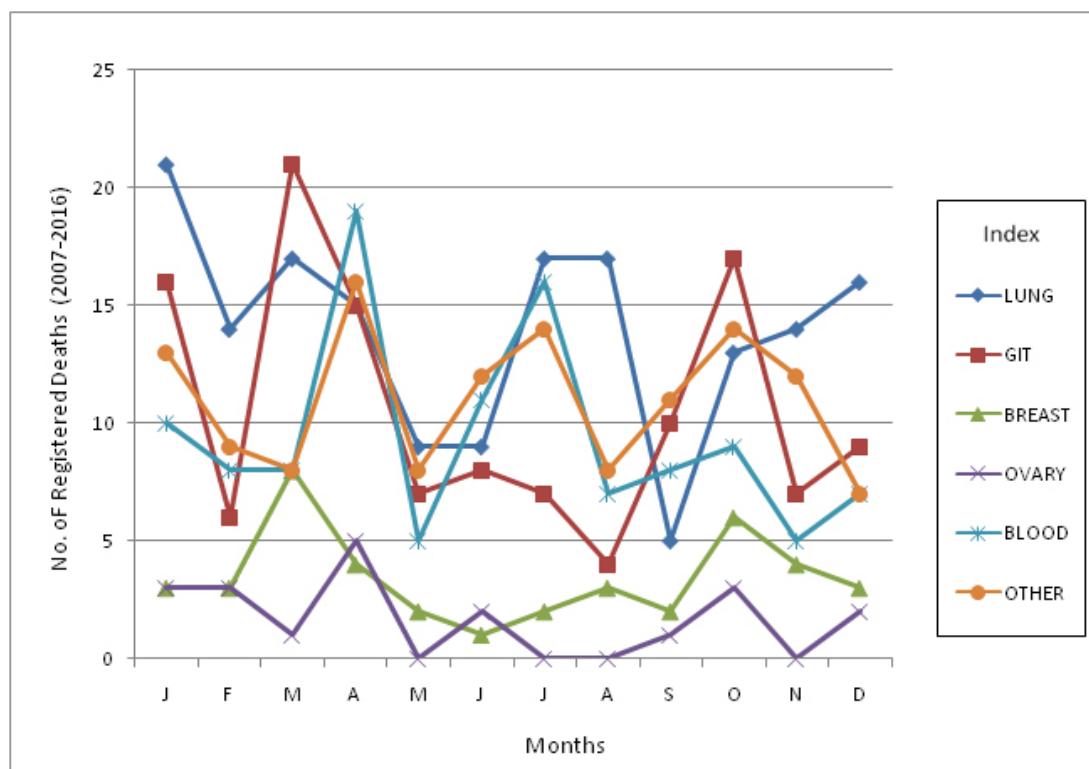
Figure 1: Annual mortality rate in Srinagar city

**Table 2: Cancer Mortality in Srinagar City by Months (2007-2016)**

(Number of Registered Deaths with % to Total)

<b>Month</b>	<b>Lung Cancer</b>	<b>GIT Cancer</b>	<b>Breast Cancer</b>	<b>Ovary Cancer</b>	<b>Blood Cancer</b>	<b>Other Cancer</b>	<b>TOTAL</b>
<b>January</b>	21 (31.8)	16 (24.24)	03 (4.54)	03 (4.54)	10 (15.15)	13 (19.69)	66 (11)
<b>February</b>	14 (32.5)	06 (13.95)	03 (6.9)	03 (6.9)	08 (18.6)	09 (20.9)	43 (7.1)
<b>March</b>	17 (26.9)	21 (33.3)	08 (12.6)	01 (1.5)	08 (12.6)	08 (12.6)	63 (10.5)
<b>April</b>	15 (20.2)	15 (20.2)	04 (5.4)	05 (6.7)	19 (25.6)	16 (21.6)	74 (12.3)
<b>May</b>	09 (29.0)	07 (22.5)	02 (6.45)	00 (0)	05 (16.1)	08 (25.8)	31 (5.1)
<b>June</b>	09 (20.9)	08 (18.6)	01 (2.23)	02 (4.6)	11 (25.5)	12 (27.9)	43 (7.1)
<b>July</b>	17 (30.3)	07 (12.5)	02 (3.5)	00 (0)	16 (28.5)	14 (25)	56 (9.3)
<b>August</b>	17 (43.5)	04 (10.2)	03 (7.6)	00 (0)	07 (0.001)	08 (20.5)	39 (6.9)
<b>September</b>	05 (13.5)	10 (27.0)	02 (5.4)	01 (8.1)	08 (21.6)	11 (29.7)	37 (6.1)
<b>October</b>	13 (13)	17 (17)	06 (9.6)	03 (4.8)	09 (14.5)	14 (22.5)	62 (10.3)
<b>November</b>	14 (33.3)	07 (16.6)	04 (9.5)	00 (0)	05 (11.5)	12 (28.5)	42 (7)
<b>December</b>	16 (36.3)	09 (20.4)	03 (6.8)	02 (4.5)	07 (15.9)	07 (15.9)	44 (7.3)
<b>Total</b>	<b>167 (27.8)</b>	<b>127 (21.1)</b>	<b>41 (6.8)</b>	<b>20 (3.3)</b>	<b>113 (18.8)</b>	<b>132 (22)</b>	<b>600</b>

Source: SKIMS Soura, 2017



**Figure 2: Monthly cancer Mortality in Srinagar City**

Cancer mortality displays lot of difference between males & females. There is approximately 50% predominance of male death over females (Table 3). Total cancer patients registered in the Cancer Death Registry were 600 (2006–2016), of which 389 (64.83%) were males and 211 (35.16%) were females (Figure 3). Overall male to female ratio was 2: 1.1. Male deaths were more prevalent than female deaths in case of lung cancer & GIT cancer.

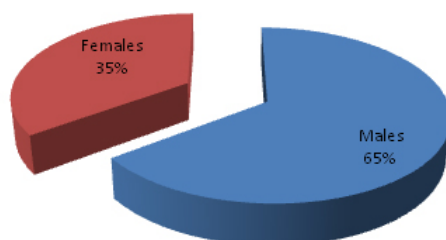
Mortality from cancer is more in the higher age group than in the lower age groups among all block of Srinagar city. Most of the patients were in the age group of 41-60 accounting for about 44% of the total (Table 4). Within this age group around 85 patients died due to lung cancer (32.1%) followed by other (21.5%), GIT (18.5%), Blood (15.1%), Breast (7.5%) and Ovarian (4.95). Even a young age of 0-5 Year age group witnessed blood cancer. The rise in the number of cancer mortality could be attributed to larger number of ageing population, unhealthy life styles, and use of various forms of tobacco and related products, unhealthy diet and in most cases, the non-availability of better diagnostic facilities.

**Table 3: Male –Female Cancer Mortality In Srinagar (2007-2016)**

(Number of Registered Deaths with % to Total)

District	Males	Females	Total
Srinagar	389 (64.83)	211 (35.16)	600

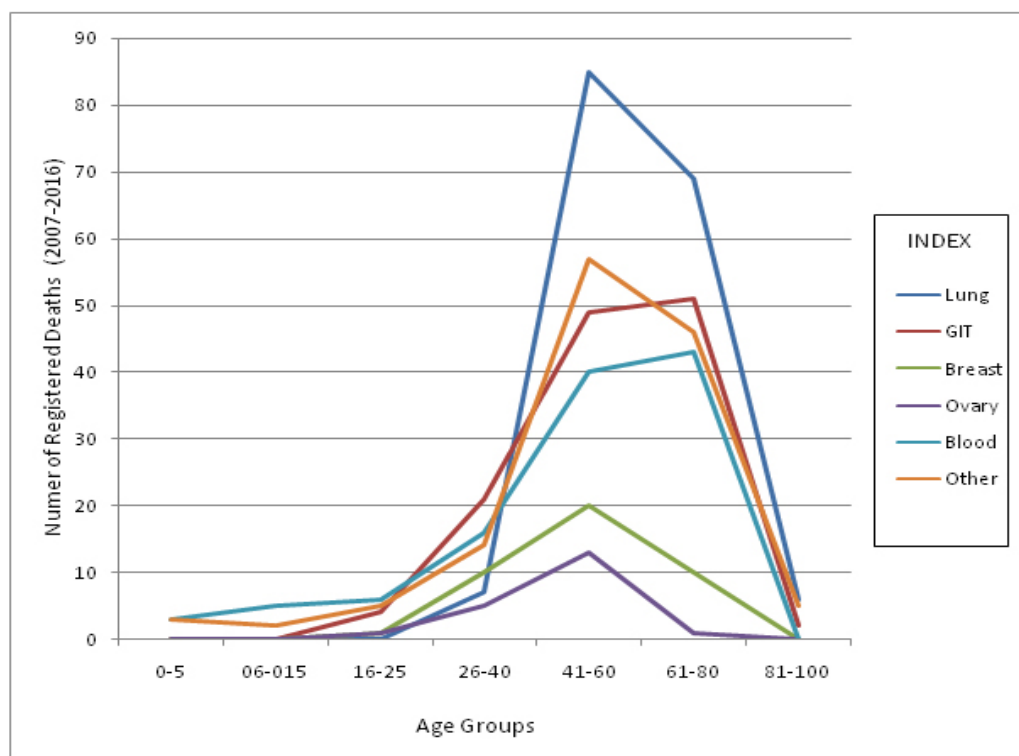
Source: SKIMS Soura, 2017

**Gender Cancer Mortality****Figure 3: Gender Ratio of Cancer Mortality in Srinagar****Table 4: Cancer Mortality in Srinagar City as Per Age (2007-2016)**

(Number of Registered Deaths with % to Total)

Year	Lung Cancer	GIT Cancer	Breast Cancer	Ovary Cancer	Blood Cancer	Other Cancer	Total
Up to 5	00 (00)	00 (00)	00 (00)	00 (00)	03 (50)	03 (50)	06 (1)
6-15	00 (00)	00 (00)	00 (00)	00 (00)	05 (71.4)	02 (28.5)	07 (1.16)
16-25	00 (00)	04 (23.5)	01 (5.8)	01 (5.8)	06 (35.2)	05 (29.4)	17 (2.8)
26-40	07 (9.5)	21 (28.7)	10 (13.6)	05 (6.8)	16 (21.9)	14 (18.6)	73 (12.1)
41-60	85 (32.1)	49 (18.5)	20 (7.5)	13 (4.9)	40 (15.1)	57 (21.5)	264 (44)
61-80	69 (31.3)	51 (23.1)	10 (4.5)	01 (0.45)	43 (19.5)	46 (20.9)	220 (36.6)
81-100	06 (46.1)	02 (15.3)	00 (00)	00 (00)	00 (00)	05 (38.4)	13 (2.1)
<b>TOTAL</b>	<b>167 (27.8)</b>	<b>127 (21.1)</b>	<b>41 (6.8)</b>	<b>20 (3.3)</b>	<b>113 (18.8)</b>	<b>132 (22)</b>	<b>600</b>

Source: SKIMS, Soura 2017



**Figure 4: Cancer Mortality of Different Age Groups**

## CONCLUSION

There is an increasing incidence of cancer mortality with considerable variation in mortality for different types of cancers in different areas with different physical, socio-economic & cultural environments in Srinagar city. Situation is changing as far as the deadly disease cancer is concerned. The diseases are alarmingly on surge. There are patients hailing from ever part of city which are diagnosed with such a terminal disease. Lung cancer, which only few years back was not witnessed in that alarming number, has surpassed the GIT cancers across city. Tobacco use is the leading cancer risk factor at the global level causing 71 per cent of lung cancer death. In Srinagar city, the situation is very grim with the highest number of lung cancer cases, which is increasing alarmingly. The cancer mortality rate among Kashmiris have increased due to some leading behavioral and dietary risks, including high body mass index, low fruit and vegetable intake, lack of physical activity, tobacco use and lack of regular check-up. The changing life style and food habits among the people had caused surge in all the cancers especially in Lung, GIT and Blood cancers.

The rise in cancer cases is also due to intake of spicy food, changing dietary habits and consumption of bulk of contaminated food items available in the market. There is massive adulteration in mass consumption food items which kills people slowly. There are increasing number of patients complaining of food poisoning, gastric troubles and other problems. Any delay in detection of the cancer can prove fatal.

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## SATISH CHANDRA: A MASTER OF COLORIST

**Abdul Salam Khan\***

**Saroj Bhargava\*\***

### ABSTRACT

*Satish Chandra (1941-2004) was born in Ghaziabad, Uttar Pradesh. He became an iconic landscape painter. He won several awards to his credit including the National Award conferred by the Indian government in 1989. His palette included all the colours in the spectrum and beyond. Variety of trees was placed in the landscape keeping in mind their importance. The small huts and the people in the canvass almost seem to be real. The birds and the canopy drive the viewer into a different world altogether. He knew how to balance the art form and never used too heavy colors in his painting that might hamper or obstruct the viewers and distract them from the main subject. He knew the importance of small aspects of nature. The beauty of the Indian landscape and villages are very well depicted in his paintings. The men and the women are shown doing their everyday work. He had maintained the everlasting connection between a spectators and the nature. This paper reviews some of his landscape paintings.*

**Keywords:** Aspect, balance, canopy, spectrum, spectators.

### INTRODUCTION

Satish Chandra is one of the great master and landscape painter of northern plain. His iconic way to portray nature is remarkable. Most of time he used the heavy plasticity or impasto technique. Though he was inspired from the western impressionism, but his mind and soul was always connected to his motherland India and he always loved to capture Indian scenic beauty in his myriad canvas.

Chandra gives justified weightage to every single tiny object whether it may be small dots or a broken dab of color or a tiny landscape figures or a wandering tiny bird in the sky. All the elements mix and form a wonderful composition that immortalises the work of the creator and evergreen master of northern plane –cum- atmospheric colorist “Satish Chandra”. Depicting

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village scene was always a passion for Chandra and it was one of the major subject for his creation though Chandra was very well acquainted with the climatic condition of village so he captured the real beauty of raw nature blended with human being and his habitant. Most of his work had vivid and bright colors having freshness and the composition are quite simple and expressive.

While going through Chandra paintings, one feels the essence of an old master. Chandra's brush handling and application of color is quite similar and evergreen as that of the old master John Constable. The approach of Chandra's work is praiseworthy. Most of his paintings are completed by layering color and heavy deposit of color creates plasticity to the painting. In other words, Chandra use impasto technique to complete his work. Chandra's works are best example of textural painting which stand closer to the work of world renowned old master J.W.M. Turner.

### **White Dazzle**

Satish Chandra was simply master of colors and he had a vast experience in portraying raw nature. His compositions were simple and bold having very strong and vibrant color scheme. He mostly used the primary or the direct color . Yellow and blue shades are the favourite color of Chandra. Here is a beautiful vertical composition of jungle scene followed by the one point perspective in middle. Chandra placed a water reservoir (pond) and nearby a lady stands with a vessel or pot to collect the water.

To portray the whole painting, Chandra used the different light and shades of yellow and green along with a pinch of titanium white in foreground. Though Chandra used the warm color, perhaps the output of this particular painting was calm, cool and very-much graceful.

In this work, Chandra articulate his first focal point as a lady with white sari having the water pot in her right hand and her reflection is clearly visible in water though figure is not visible with the features but it is prominent because of white sari. The water pot almost vanishes and only an impression of hand posture and light tints of burnt saina, yellow ochre is seen. This is only figure of the composition to enhance the beauty and motion to the painting so it is one of the the key element of the painting. Here the treatment and the application is similar as that of British landscapist JWM Turner.

In his second focal point, Chandra shows a path of pond that comes from middle of composition and flows down at foreground. Whole mass of the tints and shades of yellow only, white tints of water and the sari stand apart due to its varriation. Use of dry brush form the grannular texture enhances the painting.



**Figure 1: White Dazzle**



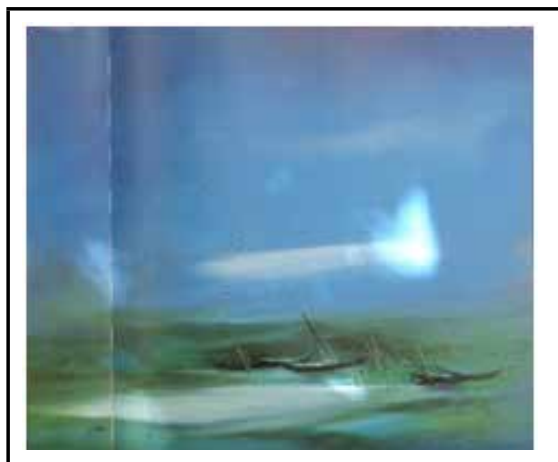
**Figure 2: White Dazzle**

Thirdly, he puts some lemon yellow tints just above the water reservoir and in the middle of the composition. This color has been applied with dry brush. Therefore, it explores in irregular manner in the center as well as some tiny lemon yellow dots are seen at the leaf of the right hand side. It refer to the highlight and its reflection is beautifully created into water.

Fourth focal point is the composition of group of tree at just left above the eye level. The plane is slightly tilted left to right and the scheme is harmonious and blended with yellow ochre. Three tree trunk are slightly bent towards the right hand side. The inter-arboreal space is filled with raw amber and just back of the trunk is yellow. There is freshness to the composition at the corner of extreme left and a patch of green leaf enhances the beauty to the painting.

### The Horrizon

Satish Chandra was always fascinated towards the light and shades of blue and green and this is one of best creation with the shades of blue and green. Here the interest area is the horrizon magically blend with cerulean blue.



**Figure 6: The Horrizon**

line is reflected as a highlighted area and on the extreme left, Chandra creates a multiple layered sap green and bluish green to show the depth of the river that finally blends with the sky.



**Figure 3 : White Dazzle**



**Figure 4: White Dazzle**



**Figure 5: White Dazzle**

The whole composition is divided into two parts. Half forms the river and rest part is treated as sky. Both are in same color but in the lower part we find some tints of sap green that creates an effect of grasses on the bank. In middle of the river, some of wooden boat are seen and near that some white scratch are seen that creates the impression of elongated grasses.

Just below the boat, a white horizontal



**Figure 7 :The Horrizon**

Just above the horizon, on the eye level, a soft patch of the white color is created that reflects as the cloud and adds on the additional charm to the paintings. One or two birds are wandering in the vast sky that creates a motion and liveliness to the composition.

Most important thing about this painting is that Chandra puts a thin film over the painting that creates a diffuse impression. On the other hand, we can say that Chandra's focus is to capture lights that takes his work in impressionism era like the painting of the great old mater Claude Monnet.

The first focal point is a pair of boat whose exterior area is created by black wood and the inner part is filled with light blue and both the boats have thin and long diagonal bamboo at the front of the boat. The structure of boat is thin and elongated and merges with the greenery. Aesthetically, it improves the composition.

The second focal point is the left edge of the first boat laid down at the right hand side of the composition. Here Chandra has articulated the boat with black wood and just below that he has placed shadow and makes more effective 3-D illusion. He uses cast shadow so that the boat looks afloat on the river. At the edge of the boat, he creates some white diagonal vertical scratches that form as grasses.

This breaks the monotony and avoid the flatness of the composition. Just below grass, a light patch is visible that creates variation from the perspective to the drawing.

Third focal point is the patch of the sky just above the middle of horizon. It is having the cobalt blue as an background along with few birds wandering hither thither. It gives the liveliness to the painting as well as it shows the perspective. The birds are created in very light black color. Some almost merges into blue sky. A horizontal beam of white cloud is shown in the middle of the sky that gives the filling of clouds and it also creates the vastness of the sky.

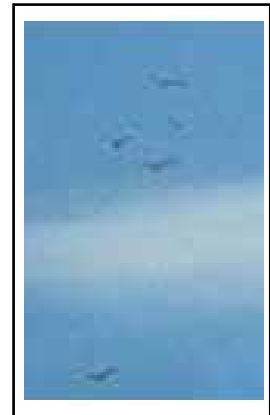
Finally the fourth focal point is the signature of the artist which is located at the extreme left of the composition. Most probably the right hand side compositions are heavy. All the elements are placed at that side. Chandra balances that heaviness by putting his signature as an element of composition.

## CONCLUSION

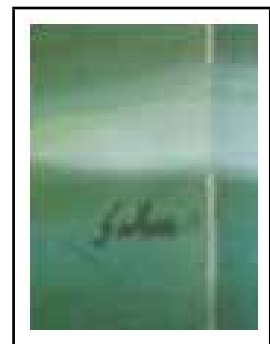
Satish Chandra is a man who is inspired by lots of other painters but he maintained his uniqueness and style. The wet on wet technique is one such example of his masterstroke that is



**Figure 8: The Horizon**



**Figure 9: The Horizon**



**Figure 10:  
The Horizon**

dominant in almost all of his painting. There is a dense connectivity and elevation in his work.

He tried to be his own model and left his impression in all of his masterworks. He delivers the best in each painting and yet manages to make the next one even better each time. All his work is evidence of his perfection and honesty.

The illusionary work of Satish Chandra is a true inspiration of passion and perfection blended together in a right way. He tried to realize beauty through his craft and the landscapes that he painted almost glittered like a real photograph every time he created anything.

### **ACKNOWLEDGEMENT**

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