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CHAIRPERSON'S MESSAGE

The global pandemic caused by the Covid virus continues to persist. The second wave has arrived in Europe. It is more than six month since India is grappling with the pandemic, national lockdown to control its wild spread and consequent impact over economy.

The normal routine in academic world has also been adversely affected. The research communities require exploration of new places, meeting diverse people and working in the laboratories in a liberal atmosphere. The social distancing norms, ubiquity of masks and restrictions on travels have dampened the liberal spirit of the research community.

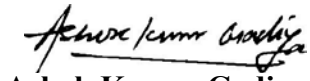
This is now visible in the flow of research papers for the Journal of Indian Research. Until and unless we receive variety of research findings, to bring out an exemplary issue out of the limited choice is extremely difficult. Inspite of such constraints, we have received quality papers from the scholars.

Afsana Rashid working at the University of Kashmir, Srinagar has sent her research over improvements of livelihood activities among women of North Kashmir. The study found that most of the widows and youth believed that conflict in Kashmir over the past more than two decades have adversely affected their livelihood patterns. Some have lost the bread-winner of the family to the conflict, others could not market their goods, some lost their jobs due to the effect of conflict on business and others shifted to alternate livelihoods. In case of families directly affected by conflict, there was greater number of child labourers, an increased dropout rate from school, frequent health problems and severe financial constraints making it hard for them to make two ends meet. Some women were still struggling hard to bring their families back to conditions that prevailed when their husbands were alive.

To overcome such a prevailing condition, what is required is impetus to the economic activities. In his 1885 article, *Datsu A-ron* ("Leaving Asia"), Japanese influential thinker Fukuzawa Yukichi (1835-1901) compared civilization to the measles because it spread rapidly. He wrote that the spread of civilization and enlightenment (*bummei kaika*) has a force akin to that of measles, Countries cannot violate the natural law of its spread. Those who forcibly try to avoid it by shutting off air from their rooms; without air, they suffocate to death. The same goes with the logic of economic growth. The state of Jammu & Kashmir was shut off from the outside. While rest of India has been on a path to catch up with the best in the world, the state of Jammu and Kashmir was caught up in the isolation.

Recently, the Indian Government has issued a notification declaring that any Indian citizen can now purchase land in the municipal areas of Jammu & Kashmir regardless of whether they are a domicile in the UT or not. However, the latest provision does not include agricultural land. The enactment of the Union Territory of Jammu and Kashmir Reorganisation (Adaptation of Central Laws) Third Order, 2020 follows the revocation of J&K's special status under Article 370 of the Constitution in August 2019. The notification has also extended domicile status to the spouse of a J&K domicile. This would help in bringing much-needed fresh breeze to the state.

I sincerely wish that the lockdowns are over soon and the pandemic is finally tamed. This would bring the much-needed fresh air to the world of academia once again.



Dr. Ashok Kumar Gadiya
Chairperson, Mewar University

EDITORIAL

The second wave of the Covid-19 pandemic is sweeping through Europe. After the winter solstice, the virus swarms might move northward. The next spring may turn out to be the determinant of the future course of the pandemic. If the swarm dissipates with world-wide anti-contagion measures, mankind will be spared another bout of large number of death. Pandemics not only ravage the livelihoods and lives, but also impacts in uncertain ways the rise and fall of the political authorities.

When the plague caused by the bacteria, *Yersinia pestis*, spread in the Roman Empire, it caused havoc in Constantinople, the then capital of the Byzantine Empire. Emperor Justinian had conquered Egypt recently and the tribute was paid in grain. In 541 AD, plague arrived through the fleas riding on the black rats binging on food grain. The empire was devastated. It is likely that the same arrived as far as India as the Gupta Empire collapsed simultaneously. Vishnugupta was the last Gupta king whose rule ended in 550 AD. Even great astronomer and mathematician Aryabhata(476 AD-550 AD) could not survive. Nearly half of the world's population was killed. A fresh look at the history through the eyes of pandemics can throw some more light on sudden collapse of the empires.

Similarly, when The Black Death arrived in Europe in 1347 AD, it decimated much of the population of Eurasia. Between 1346-1353 AD, it killed more than 200 million people. When the next waves hit the Mongol capital, Dadu in 1361 AD and then in 1368 AD, the Yuan Empire collapsed leading to the establishment of Chinese Ming dynasty. Estimates suggest that the English population dwindled from a high of 5.8 million to mere 2.6 million during 1348-1351 AD. English villages were emptied of people. There was lack of labour to harvest. With absence of sufficient number of serfs and peasants, the old economic system collapsed. Labor became scarce and required better pay and facilities for labourers. This led to the end of the serfdom. The lack of cheap labour further catalyzed innovation in technology leading to the advent of the modern civilization based on machines run on power.

Till the modernity, most of the pandemics were caused by the bacteria. But, the nature of pandemics also changed with the technological change. The first influenza pandemic is reported in the year 1580 AD. The first use of the term "influenza", though appeared in scientific literature in the year 1650 AD.

Influenza is caused by viruses and unlike plague, these are air-borne. While plague was carried through horses and boats, influenza spread accelerated due to the emergence of steam engines and steamer ships.

In 1918, an H1N1 influenza strain emerged to cause the Spanish flu pandemic. This was the worst medical disaster in human history. The pandemic had three distinct waves: the spring of 1918, the fall of 1918, and the winter of 1918–1919. The first and the third were mild, but the second one caused maximum death. Global death toll is estimated between 40–50 million, most of these deaths occurred over a four-month period in the autumn of 1918. In India alone, 10 million people perished during the second wave.

The pandemic also ended the British supremacy of global diplomacy and USA emerged as the rising hegemon from the ashes of the First World War.

The current pandemic is still not over. There is discernible pattern that while Europe and the USA are struggling to minimize the crisis; Asia, Africa and Oceania have managed pretty well. The winter is long and Europe is in severe grip once again.

It is likely that in the post-pandemic world, social distancing would become ubiquitous with the advent of the digital technology. There may be deschooling and deofficialization. Classrooms and office meetings would be held digitally rather than physically. There might be geopolitical ramification. A rising China is aggressively expanding its fangs while the declining hegemon, the US is getting caught up in the mismanagement of own making.

Historians have only recently started considering the role of environment and epidemics in changing the course of history. We need to rethink over our pasts and then plan for a better liveable world in the post-pandemic future.

Niraj Kumar

Honorary Editor

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GENDER AND LIVELIHOODS IN RURAL KASHMIR: A STUDY IN BARAMULLA AND BANDIPORA DISTRICTS IN NORTH KASHMIR

Afsana Rashid*

ABSTRACT

The conflict in Kashmir Valley has deeply affected people's livelihood especially women, who face the major brunt of the situation in the valley. Usually women, a vital work-force and significant contributors to the growing economy of any society, face innumerable challenges on account of lower mobility, less access to training, market and resources. Employment prospects of rural women are usually limited and they are mostly engaged in informal and unorganised sectors where the wages are meagre. Various livelihood plans, policies and schemes offered by the government for women fail to act as a soothing balm for them due to cumbersome procedures involved in availing them and lack of awareness about these programmes and absence of marketing facilities for the finished products.

Livelihood patterns of rural women in conflict-torn Kashmir region together with rights and entitlements associated with them have been explored here. The way conflict has impacted their livelihood options and patterns has been analyzed and the hurdles faced by women in protecting their livelihoods in a conflict situation has also been studied. The paper further explores women's access to various welfare programmes and their negotiations with power structures at local level. A comparative analysis of the situation of women who have been targeted by certain interventions especially by government/non-government organizations and those who have not been targeted by such projects has also been provided.

Keywords: Conflict, gender, Kashmir, livelihood, local power structures, Self-Help Group.

INTRODUCTION

The conflict in Kashmir Valley that began in 1989 has deeply affected people's livelihood, their work and workplaces, apart from their environments, health, access to education and so on. Women, who comprise almost half of the population, have felt the impact most severely. As per Census 2011, Jammu and Kashmir has population of 1.25 crores, of which male are 6,640,662 and female are 5,900,640. Being key agents of development and significant contributors to the growing economy, a number of plans, policies and schemes have been launched by the government for women. For example, the basic idea behind National Rural

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Livelihood Mission (NRLM) is to form self-help groups (SHG) especially for women and help them to start some entrepreneurial activities. Formalization of self-help groups is seen as an effective tool for empowerment of women. Similarly, Swarnjayanti Gram Swarozgar Yojana (SGSY) introduced in 1999 aimed at bringing poor families above poverty line by providing them income -generating assets through mix of bank credit and government subsidy that covers all aspects of self-employment such as organization of poor into Self -Help Groups (SHGs), training, credit and marketing. National Minorities Development and Finance Corporation provides loan to women so that they can set-up their own income generating units.

The term 'livelihoods' has become significantly important in development theory and practice as it is seen to incorporate a wide range of concerns and to allow inclusion of broad range of people's activities and assets in considering how they support themselves instead of focusing more on income-generating or formal activities. The most widely used definition of livelihoods is one put forward by Robert Chambers and Gordon Conway (1992):

"A livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living".

Haan and Zoomers (2003) define it as:

"*The concept of livelihood is about individuals, households or groups making a living, attempting to meet their various consumption and economic necessities, coping with uncertainties and responding to new opportunities. Livelihood not only captures what people do to eke out their living but involves the risk factors that facilitates or prevents them in their pursuit to improve their living".*

In view of this scenario, a study was aimed to explore livelihood patterns and the rights and entitlements associated with them, to analyze how conflict has impacted their livelihood pattern and to examine hurdles faced by women in protecting their livelihoods in the conflict situation and their access to welfare schemes offered by the government. Women from economically weak families were approached for access to rights and entitlements. Focus was laid on challenges and aspirations of women with regard to gender and livelihood. A comparative analysis of the situation of women who had been targeted by certain interventions especially by some government/non-government organizations and those who have not been targeted by such projects has also been provided.

FOCUS OF THE STUDY

Emphasis has been laid on widows, half-widows (whose husbands have been missing for several years), members of women SHGs, local women who were not part of SHGs, working women such as teachers, *Anganwadi* and *Asha* workers and housewives and those associated with agriculture and home-based industry like carpet weaving, embroidery work, etc. Also, it includes youth to find out various livelihood opportunities available to them and if conflict has, in any way, affected their livelihood pattern.

SCOPE AND RELEVANCE OF THE STUDY

The study becomes all the more important and significant in the context of trouble-torn region like Kashmir Valley. Since livelihood is a fundamental building block of any society,

exploring various livelihood patterns in a conflict region becomes vital, particularly when it deals with women's empowerment and entitlements associated with it. The study further became significant as it throws light on how conflict impacted livelihood patterns of women and explores available rights and entitlements associated with it. No such study has so far been carried out in the valley. Keeping in view the sensitivity and importance of the study, it can be said that the same will go a long way in determining the economic empowerment of women at the grassroots level by identifying the challenges and hurdles faced by them and the way forward. It can also be useful for policymakers and planners to identify the lacunae in the prevailing system and devise a strategy/mechanism to channelize the tremendous potential of local human resources at an appropriate time and in the right perspective.

REVIEW OF LITERATURE

Insecurity, an unstable environment and poor governance due to long-standing Kashmir conflict has inflicted a deep sense of mistrust and hopelessness among people in Kashmir, in general. It has rendered women, children and youth vulnerable, in turn leading to unemployment, poverty and socio-economic disparities. Women, in particular, bear the brunt, face innumerable challenges and suffer silently.

Women have been especially vulnerable and that has impacted their health and well-being, directly and indirectly, observed Kashmir's renowned sociologist, Bashir A. Dabla while pointing out how militarization and conflict in the valley have had an effect on every aspect of life in the region, be it socio-economic, educational, psychological and cultural. In his 2010 study, Dabla noted that there were 2,000 widows and 97,000 orphans in Kashmir and the number is growing. Most widows and orphans in Kashmir face multi-dimensional problems that include loss of education, depression, social disorganization, insecurity, deterioration of health, dependence on others and problems of accommodation. He noted that widows and orphans became debased, economically, especially the younger ones. The study provided an empirical look into the problems faced by widows and orphans. Divided into nine chapters, the report discussed several problems and financial constraints of widows and orphans. There were, however, certain areas that required further research and could be consequently, improved. Case studies would have added significance to the work.

Conflict destroys the safe environment provided by a house and a family, leads to inadequate nutrition, education and unemployment. The civic services became inaccessible, education, civic amenities and health care facilities remained just in name (Rather, 2013). Women also became indirect victims of arrest, torture, disappearance, displacement and loss of loved ones and direct victims of physical violence such as rape, abduction and murder (Bhat, 2009). Continuous armed conflict has caused disruption in their education, job opportunities, disruption of services and breakdown of social support systems leading to profound negative impact on overall well-being of women. Lack of adequate institutional and economic support from the state government continued to be a major grievance amongst the local populace in Kashmir (Ray, 2009). The study mostly covered the political aspect of the situation and made only a passing reference to the socio-economic problems of widows or women in general. Though the study suggested that a great deal needs to be done by the state and other political activists to ameliorate the conditions of women in Kashmir, but has not as such, put forth any

concrete recommendations.

Analyzing literature on sustainable livelihood and gender, it can be said that women, who form half of the population in any society, are key agents of sustainable development and livelihoods. Livelihoods are generated from a variety of sources and activities which vary over time. Livelihood strategies are the sum of all the different activities that people do in the context of their livelihood and are based on access to and a combination of five forms of capital assets – human, natural, financial, social and physical capital (Omuta, 2013). Livelihood strategies are influenced by access to and control over assets, access to markets, information and organization, effective management of vulnerability and interaction of these policies at global, national and local levels (Nazneen, 2010).

There are a number of financial service providers in rural areas such as banks and microfinance institutions. They offer a range of services to the poor such as credit, savings, insurance, remittance services and leasing. Microfinance, which has emerged as a key strategy in South Asia for poor women to access financial assets, is also a mechanism for coping during agricultural lean periods and for diversification into non-agricultural based work (Nazneen, 2010). Studies have analyzed the benefits of microfinance programmes and their impact on women at the individual and household level. Though some studies suggest the overall impact of credit on the well-being of women has been positive, but whether or not credit is empowering women has been the subject of debate.

Estimates show there are more than 25 lakh SHGs in India, out of which 90 percent are entirely women-oriented. SHGs are a small group of individuals who voluntarily come together and are constituted by persons known to one another and from the same area/village community. SHGs are small in size with 10 to 20 members and they start with savings and then use the savings to extend loans to its members to meet their emergency and other needs. The concept of SHGs is mainly based on the principle of Saving, Credit and Self Help (Singh, 2017). The SHG-Bank linkage programmes have become a well-known tool for developmental agencies and corporate houses in the past two decades (Irshad & Bhat, 2015). With the help of SHGs women can be trained for various skill development programmes and will help them in their social and political development (Khurshid, 2015).

Self-help micro-credit programmes have played a valuable role in reducing vulnerability of the poor through income generation, creation of assets and control over these assets (Anuppalle & Reddy, 2008). Self-help credit based economic activities have facilitated women to take decisions regarding their personal and household needs and availing other recreational facilities. The progress made by SHGs in Jammu and Kashmir is slow but these groups have developed the morale and confidence of every woman that is a part of these groups and these groups have helped to solve the community issues and in raising their economic standard. Programmes, as such, should be organized to generate awareness among women about these groups (Irshad & Bhat, 2015). Singh & Mehta (2012) emphasized that rural people have vastly benefited from microfinance in terms of socio-economic upliftment. Housewives and labourers have been the major constituents of SHGs. Once they join SHGs, the level of communication and interaction of the members with officials improves. SHGs have proved that they can serve as an alternate instrument of financial intermediation for the poor.

Women's voices are crucial in highlighting their livelihood concerns and in promoting their interests, both at the local level and within the national policy-making processes. Consequently, India introduced gender reservation at all tiers of local governance in 1992. Studies comparing functioning of local councils in West Bengal and Rajasthan showed that there was a systematic difference in complaints and requests filed based on gender. The number of drinking water projects was 60 percent higher in female-led councils compared to male-led councils. However, the presence of women representatives in the political structure at the grass root level in Jammu and Kashmir, over the past many years, was almost dismal as the Panchayati Raj system was defunct in Kashmir for many years. The Panchayati Raj election was conducted in the state in 2011 after a gap of almost three decades followed by the recent one in 2018 and many women participated in these elections.

However, neither reservation for women nor their actual presence in panchayats has brought about sensitivity to problems related to village women and women who are elected are not always treated with due respect (Kaul & Sahni, 2009). The study conducted in seven blocks of Jammu district stressed that many elected women complained that their suggestions were not considered seriously nor were they consulted while decisions were being made. Some even felt their views were ignored only because they were women and at times, they were pressurized by their husbands to approve the decisions made by male-dominated panchayats. Creating gender sensitive state services, policymaking arenas and legal reforms are crucial for making space for women (Nazneen, 2010). These reforms will make public service providers and policy makers to act in a more gender equitable manner.

In this context the study becomes imperative and an effort was made to find out impact of conflict on livelihood patterns for women and how do women negotiate with power structures at the local level (panchayat leaders, religious leaders and mohallah committee members, etc.).

RESEARCH DESIGN

Even though sustaining livelihoods is critically linked to enhancement of financial, physical, natural, social and human capital, conflict is presumed to be the main, if not sole, driver of livelihood vulnerability. The study aimed to explore impact of conflict on livelihood options and patterns for women and whether women have negotiated with power structures at the local level.

OBJECTIVES OF THE STUDY

The objectives of the study are to:

- Explore livelihood patterns and the rights and entitlements associated with them;
- Analyse how conflict has impacted livelihood options and patterns and the social group to which the most affected women belong;
- Examine hurdles faced by women in protecting their livelihoods in the conflict situation and their access to welfare schemes offered by the government;
- Understand whether women have negotiated with power structures at the local level;
- Study the changed attitudes and aspirations with regard to economic empowerment.

METHODOLOGY

To meet the objectives, a research study was designed to generate data on the subject using both quantitative and qualitative methods of data collection. The quantitative data was collected from two districts of Baramulla and Bandipora in north Kashmir through structured interview schedule and the qualitative data was collected through indepth interviews to obtain deeper insights into the subject. The findings were derived from the analysis of data emanating from the field study and indepth interviews. Once data was collected, it was coded, tabulated and interpretations drawn. Statistical techniques were used for the interpretation of data.

Three set of Interview Schedule were used: Interview Schedule I catered to Local Women Government Employee (LWGE), Local Women Self-Employed or Employed in Private Sector (LWSEEP), Local Women Unemployed Working in Homes (LWUWH), Local Women Self-Help Group (LWSHG) and Widows and half-widows; Interview Schedule II catered to youth while Interview Schedule III catered to village heads (sarpanch and panch) and religious leaders (clerics and imams). Interview of officials from government and financial institutions (banks and cooperatives) was also conducted.

The interview schedule also included qualitative questions that helped in understanding the livelihood patterns of such women and the rights and entitlements associated with it. It also tried to assess the reaction of these women with regard to SHGs and how they viewed their association with them, what percentage of such rural women have actually benefitted from these groups and suggestions to make such programmes more effective and goal-oriented.

Piloting: A pilot study was conducted to refine or enhance research tools to be used for the study. Based on the feedback, certain changes were made in the interview schedule. The hypotheses matrix identified before the pilot study was further expanded and final hypotheses matrix framed.

Sampling: The sample size was satisfactory both in terms of quantity and quality. The samples were selected in such a manner as to adequately capture all the categories in the given data strata so as to establish the credibility of the research. Once sampling was done, accuracy was also established. Based on both quantitative and qualitative approach, the study was descriptive, analytical and empirical. While quantitative data was collected using interview schedules, few case studies were included to provide a broader and deeper insight into the issue.

A mix of sampling techniques included random, stratified and cluster sampling. This ensured equal representation to each variable related to the study. Ten villages were taken from Baramulla district and five from Bandipora district. There were fewer constraints on sample size since case studies were included in the study that provided qualitative treatment of the subject matter along with the quantitative study. The case studies explored the broader contours of the given scenario and provided insights into the trajectory of restructuring for better performance/improvement of studied subjects and entities such as SHGs, conflict affected women, power structures at local level (panchayat) and socio-economic welfare schemes. The Solvin's formula known in statistical literature was used in determining the sample size.

$$n = N / (1 + N e^2)$$

Where, 'n' = Number of samples, 'N' = Total population and 'e '= Error tolerance

Here we put the size of population to be sampled at seven lakhs. This is the total population of women in the two districts of Baramula and Bandipora sample size was arrived at as follows:

Table 1: Female Population in Two Pilot Districts

Census 2011	**Districts**		
	Bandipora	**Baramulla**	**Total**
Total Population	385099	1015503	658180
Female Population	184848	473332	

Using this formula for a female population of seven lakhs, sample size 'n' turns out to be 267, assuming an error tolerance of 6 % and 95 % confidence level. Based on this, a sample of 288 respondents was taken from the two districts for the purpose of study. Due representation in proportion to population was given to both the districts.

The following Table shows the sample distribution based on the above calculations.

Table 2: Stakeholder Type

Stakeholder Type	**District wise Sampling Size**	
	Baramulla	**Bandipora**
LWSHG	44	14
LWUWH	34	14
LWGE	30	15
LWSEEP	31	17
Widow	31	14
Youth	29	15
Total	**199**	**89**
Grand Total	**288**	

Youth formed a separate group whose age ranged between 16 to 23 years. It was anticipated that this group would exhibit different behaviour. This was an attempt to implement stratified and clustering sampling implicitly with random sampling used within particular clusters and strata. Furthermore, equal representation was given to women members from each selected SHG. Here, random sampling was followed in selecting the SHGs as well as the women members. Three members were randomly taken from each selected SHG for the purpose of study. Case studies were included for the qualitative element and sample size had no significant role here as it involved a study of situations rather than generalizing about situations.

The following chart is the sampling baseline matrix listing out sample distribution vis-a-vis district, village and respondent type. A total of 288 sample was taken based on the above formula. Apart from the selected villages, two additional villages, Moulabad (Magan mohallah) in Baramulla district and Tregam in Bandipora district, were included

in the study to compensate for non-availabilty of SHG samples in the baseline villages. In the qualitative study, Yadeepora in Baramulla district was included to study the female sarpanch so that information could be derived on whether gender played any role in developmental activities.

			Respondent Type						
District	S.No	Village Name	Self help group member	Govt. Employee	Unemployed - Housewife	Widow	Self employed or employed in private sector	Youth	Grand Total
Baramulla	1	BUREN	7	4	3	4	3	3	24
Baramulla	2	TRIKOLBAL	6	2	3	3	3	3	20
Baramulla	3	PALHALLAN 'A'	3	3	5	4	3	3	21
Baramulla	4	PALHALLAN 'B'	3	3	3	3	3	3	18
Baramulla	5	PALHALLAN 'C'	3	3	4	2	3	3	18
Baramulla	6	PALHALLAN 'D'	3	3	3	3	3	3	18
Baramulla	7	PALHALLAN 'E'	3	3	3	3	4	2	18
Baramulla	8	PALHALLAN 'F'	3	3	3	3	3	3	18
Baramulla	9	HANJEEVERA BALA	3	3	3	3	3	3	18
Baramulla	10	HANJEEVERA PAYEEN	4	3	4	3	3	3	20
Baramulla	11*	KHANPATH	1						1
Baramulla	12*	MOULAABAD	5						5
Total			44	30	34	31	31	29	199
Bandipora	1	DANGERPORA		2	3	2	3	6	16
Bandipora	2	KAWPORA	4	3	2	3	4	3	19
Bandipora	3	SARAI DANGERPORA	3	3	3	3	3		15
Bandipora	4	SHADIPORA	4	3	3	3	3	3	19
Bandipora	5	SHATULPORA	3	3	3	3	3	3	18
Bandipora	6*	TREGAM		1			1		2
Total			14	15	14	14	17	15	89
Grand Total			58	45	48	45	48	44	288

*Note:The samples were collected from these villages due to non availabilty of relevant samples from baseline village set of 15 villages,10 from Baramulla and 5 from Bandipora

Data Analysis: Once data was collected, it was analyzed and interpreted. The data was divided into groups and sub-groups. It was coded, tabulated and statistical inferences drawn. Coding revealed which categories of data were transformed into symbols that were tabulated and counted. After coding, the stage was set for tabulation, which is a part of a technical procedure wherein classified data was put in the form of tables. The analysis after tabulation was based on a computation of various percentages and averages by applying various well-

defined statistical formulae. The results of research were specified clearly and precisely using tables, bar charts and pie charts.

Study area: Baramulla and Bandipora districts in north Kashmir were selected for the purpose of study and due representation was given to each variable in the study. Baramulla district is one of the districts in Jammu and Kashmir, and its district headquarter is situated at 34.1980° N Longitude and 74.3636° E Latitude. The district headquarter is about 55 kilometres from summer capital Srinagar and the town is located on either banks of river Jhelum. Bandipora, on the other hand, is a newly carved out district from erstwhile Baramulla district in 2007 and is surrounded by Kupwara district in the west, Baramulla district in the south and Kargil, Srinagar and Ganderbal districts in the east. Located on the banks of the Wular Lake, the district lies to the north of Srinagar. The district headquarter is well connected to the capital city by road and is about 56 kilometres by road to Srinagar.

RESEARCH FINDINGS

Monthly Earnings, Savings and Spending by Women

The study found that the average monthly earning of widows was marginal and the group was followed by remarried and unmarried women. The income of widows was found to be the lowest among different categories of women. It was Rs. 305 per month for widows followed by Rs. 312 per month for women who have remarried, Rs. 875 per month for unmarried women and Rs. 1,207 per month for married women. Literacy and earnings of women were directly related and literacy was a major deciding factor in the increase in wages. Illiterate women earned less than literate women. As compared to average monthly income of Rs. 2305 for literates, the average monthly income for illiterates was found to be just Rs. 596.

Average monthly spending among the respondents ranged between Rs. 1,600 to 3,000, with widows showing the lowest (Rs. 1,607/-). Local Women Self Help Group **(**LWSHG) is the highest group with Rs. 3,000 followed by Local Women Government Employees (LWGE) with Rs. 2,973 closely followed by Local Women Unemployed Working in Homes (LWUWH) with Rs. 2611 and Local Women Self-employed or Employed in Private sector (LWSEEP) with Rs. 2106. It is pertinent to mention here that this is the family spending done by women. Other sources of income are the earnings of other family members, including that of husband, son or brother or any other head of the family.

Average monthly savings were found to be the least in case of LWSHG with Rs. 78.44 followed by Rs. 115 for the widows and the highest was that of the government employees (Rs. 1129). Average monthly income of different women groups was found to be the lowest in case of SHG members (LWSHG) with Rs. 329/-, followed by widows who had an average monthly income of Rs. 344/-. Local Women Unemployed Working in Homes (LWUWH) mostly drew finances from their husbands.

Decision on Earnings

Majority of women took their own decisions with respect to their earnings. It is considered spending of the income generated or earned by her. While in case of widows, decisions were

taken by woman herself, in LWSEEP category women took the decision themselves in 50 percent cases followed by the collective decision with their husbands in 45 percent cases and in 5 percent cases it was taken by husbands. The average spending was more if sons or other guardians also contributed in the family income. In case of LWGE, decision was taken by husband in 5 percent cases, in 25 percent cases collective decision was taken by husband and wife and in 70 percent of cases by woman herself. In case of LWSHG, collective decision was taken by husband and wife in 32 percent cases and by woman themselves in 68 percent cases.

In case of respondents with educational qualifications 10th-12th standard, decision on earnings was taken collectively by husband and wife in 18 percent cases, by husbands in 8 percent cases and, in 74 percent cases women themselves took the decision. Women with professional degrees took their own decisions vis-à-vis earnings. The decision in case of the respondents, who had studied from 6th to 10th standard was taken collectively by husband and wife in 32 percent cases, in 4 percent it was husband only and in 64 percent it was the woman herself. The decision in case of illiterate women was taken collectively by husband and wife in 32 percent cases, in 2 percent by husband and in 66 percent cases, the decision was taken by the woman herself. Women graduates took decisions jointly with their husbands in 32 percent cases and in 68 percent the decision was taken by women themselves. All the women who had post-graduate degree took their own decisions vis-à-vis their earnings. Respondents who had studied upto 5th standard took decisions jointly with their husbands in 40 percent cases, in 20 percent cases the decision was taken by husband only and in 40 percent cases by the woman herself.

Women in the Handicraft sector

Women employed in the handicraft sector often worked under harsh conditions. Majority of them had no written job contracts. Only 1 percent had a written job contract, 30 percent had the employer's word and 69 percent had no contract at all. In fact, an employer's word did not capture any job related clauses as is found in standard job contracts. For this reason, it can be deemed as 'no contract' at all. This meant that 99 percent of women in the study area worked without any contract, on low wages and with no benefits at all.

Self-Help Groups (SHGs)

While majority of respondents (61 percent) knew about SHGs, 39 percent did not. Again this set of respondents did not include youth. When the respondents, who were aware of SHGs, were asked about the definition of SHGs, 97 percent of them described it as a group of women working together and sharing benefits, for 20 percent it meant increase in income and 1 percent termed it a useless activity. Furthermore, most respondents (52 percent) said they can not say if SHGs helped local women, 36 percent felt SHGs have helped local women and 12 percent observed that these groups have not helped local women at all. These questions were put before women of all categories, except youth and SHG members. Majority of the women (91 percent) who felt that SHGs have helped local women observed SHGs have provided women members with greater opportunities to work, 55 percent felt that they have helped them in developing contacts, 30 percent said that it improved their skills of communication and 12 percent observed that it provided them exposure to outside world. This was a multiple option question.

Majority of the respondents (60 percent) said that they can not say if SHGs can become a sustainable financial support for widows, 26 percent however, believed that SHGs can become a source of sustainable financial support for widows and 14 percent said SHGs can not become such support. Those who said that SHGs can become a source of sustainable financial support cited skill training (88 percent), more livelihood opportunities (88 percent) and more monetary returns (46 percent) as the reasons responsible for the same. This multiple-option question was asked to those respondents, who replied in affirmative to the earlier question. Those who said SHGs cannot provide sustainable financial support to widows argued that it was difficult for them to market the products manufactured (42 percent), SHGs do not provide locally backed sustainable business models (30 percent) and there is no scope and mechanisms for identifying the innovative ideas and members for SHGs (33 percent). This too was a multiple option question.

While majority of respondents did not want to join SHGs (68 percent), 32 percent wanted to join such groups. When interpreting the perceived sustainability of the SHG model with actually felt behaviour of SHG members, the results obtained have been depicted below.

Role of SHG in improving the financial condition of the family	n
Yes	54
No	4
Total	**58**

If yes, how has it helped?	n	%
Increase in income	46	46.46
Imparted skill training that helped in generating income	30	30.3
Self-reliant	20	20.2
All of the above	3	3.03
Total	**99**	**100**

If no, how has it not helped?	n	%
SHGs do not provide locally backed sustainable business models	3	60
Difficult to market products manufactured by SHGs	2	40
Total	**5**	**100**

Ninety-one percent respondents said they did not find any growth in the monthly earnings of SHG members over the past two years (2011-2013). However, it increased twice in 7 percent cases and increased by Rs. 1,000 in 2 percent cases. In the majority of cases, purpose of SHG group fund was to meet the healthcare needs of the members (28 percent), followed by their financial needs (10 percent), developing business and generating more income (10 percent), meeting their daily needs (07 percent) and able to save money (02 percent).

While in most cases the loan amount was used for non-entrepreneurial activity (93 percent), only in few cases (07 percent) it was used for entrepreneurial activity. As mentioned earlier, the loan amount was primarily used to meet healthcare expenses (48 percent). This was followed by meeting the daily needs of the family and the household (17 percent), to help the members who faced financial constraints (17 percent), used for shawl-making, embroidery and poultry (6 percent), construction of house (1 percent), school fees for children (3 percent), paying installments of loan that her husband had taken from banks etc. (1 percent) and for 3 percent, they were not able to put forth any reason. Most of the respondents felt financially stable after joining SHGs (82 percent). There was also improvement in decision-making (57 percent), information, education and awareness generation (57 percent), improved expression (43 percent) and exposure to the outside world (7 percent). A very small percentage felt only a minor change or no change at all (1 percent). This was a multiple-option question.

Majority of non-SHG members were not attracted to SHGs: 71 percent of the respondents said they cannot compare themselves with SHG members, 20 percent said they have less opportunity to work, 7 percent believed themselves to be at par with SHG members, 1 percent felt less privileged than SHG members and an equal percent of respondents felt higher in status and salary than SHG members.

Interaction of Women with Village Head

Sixty-one percent of the respondents said they interacted with village head/power structures, 37 percent said they did not interact with village head/ power structures and just 2 percent said that they had never thought about it. Amongst SHG members, 22 percent said they did not interact with village heads, 2 percent said they had never thought about it and 76 percent interacted with them. In case of the government employees, 29 percent said they did not interact with the village head while 71 percent interacted with them. In the case of unemployed women working in homes, 2 percent said they had never thought about interacting with the village head, 40 percent said they did not interact with village heads and 58 percent said they interacted with the village heads. Thirty-six percent of widows did not interact with village heads whereas 64 percent did. In case of self-employed women or those employed in the private sector 2 percent said they had never thought about interacting with the village head, 30 percent said they did not interact with village head and 68 percent said they interacted with village head. Four percent of the youth said they had never thought about interacting with village head, 52 percent said they did not interact with village head and 44 percent said they did.

Most respondents (79 percent) did not find interactions with the village head/power structures useful while only 21 percent of the respondents found such interactions useful.

In case of SHG members 72 percent said the interactions were not useful; 67 percent of government employees' interactions had not been useful, 87 percent of unemployed working in homes said they were not useful; 82 percent of widows, 73 percent of self- employed or those employed in the private sector and 95 percent of youth did not find these interactions useful. The majority of respondents had been interacting with village heads over the past five years (2009-2013). All SHG members said they had been interacting with the village head between upto 5 years, 97 percent of the government employees had been interacting with them over the same period and the remaining had been interacting with them for the past 10 to 15 years. All unemployed women working at home said they had been interacting with village heads/power structures over the past 5 years, 98 percent of widows had been interacting with village heads over the past 5 years. The self-employed or employed in the private sector and youth had been interacting with the village head/power structures over the past 5 years.

Decisions Taken About Family and Development of Village

Majority of the respondents (52 percent) said they had a say in family decisions and decisions with regard to development of their village.

Government Welfare schemes

Most of the respondents (72 percent) said they had information about government welfare schemes whereas 28 percent said they had no information about such schemes. Eighty-two percent of the respondents said they received no support from the government, whereas only 18 percent said that they received support from the government. The government schemes availed by the respondents included: Scholarship for children (29 percent); Indira Awaas Yojana (IAY) (21 percent); loans (4 percent); MGNREGA (33 percent); and widow/old-age pension (25 percent). Thirty-nine percent of the respondents did not avail any of these schemes. This was a multiple option question.

While 44 percent of the respondents were satisfied with these schemes, but fewer monetary benefits and a need for enhancement were constraints stressed by 39 percent of respondents. Others thought it to be cumbersome and time consuming (15 percent), still others felt it invited gender-based exploitation (10 percent) and some others observed that they could not avail it as bribe was demanded (5 percent). This too was multi-option question.

Effect of Conflict on Livelihoods and Families

Most of the widows and youth said that conflict in Kashmir over the past more than two decades has adversely affected livelihood patterns of people in many ways. The marketing of goods had been affected, some had lost employment and others had shifted to alternative livelihoods. Some had lost the bread-earner in the family due to disappearance, natural death, murder in village conflicts and serious health ailments. This too was a multiple option question.

Most of the respondents had not filed a case in the concerned government institution (77 percent) while some had (10 percent) and others said that they did not know the procedure of registering the case (13 percent). This question dealt with widows only. Most of the respondents

(69 percent) had received a share in the property of the husband after his death/disappearance. This question too dealt with widows only.

The conflict had affected families in number of ways. Schooling of children had stopped in 87 percent of the respondents with frequent health problems among the family members spread across the whole sample. Forty-five percent of the respondents said that they had to go without meals at times and in 10 percent of cases, the schooling of girl children had stopped while the schooling of male child continued. This was a multiple-option question. The respondents said that support from other family members like father-in-law, brothers, parents etc. helped them to deal with the situation. Some started working, others received support from government schemes and some became dependent on alms/charity.

Most of the respondents (69 percent) said that they were still struggling to bring stability back to the home. Lack of education and skills was one of the main reasons why the respondents made no effort to improve the economic health of their family and the society. Lack of schemes in the government and non-government sector, unfavourable conditions due to curfew and shutdowns and lack of money to pay bribes to those who provide employment schemes were the other contributing factors that stopped them from improving the economic health of their respective families.

School Dropouts in Families Directly Affected by Conflict

One child in each of the 17 families, two each in six families, three each in two families and four each in three families were dropouts, putting the total number at 47. There were nine child labourers in families before they lost their male bread-winner, while the figure went up to 48 child labourers in the same number of families after they lost the male breadwinner.

Economic Empowerment

The respondents described economic empowerment as involvement in taking decisions in family matters and financial independence. Fifty six percent defined economic empowerment as involvement in taking decisions in family matters and 58 percent defined it as financial independence, 24 percent of respondents felt it was a form of compromise in the absence of male earning members and 28 percent considered it as greater control over family resources. For 7 percent of the respondents, economic empowerment meant increase in exposure level, 2 percent cited 'all of the above' reasons as economic empowerment and 2 percent felt 'none of these' definitions applied to economic empowerment. This was a multiple option question.

In case of SHG members, almost 97 percent of the respondents felt that economic empowerment changed their lives. They felt that support from family, government schemes, SHGs, good education and skills helped them to achieve economic empowerment.

Case Studies

Detailed interviews of some of the widows, half-widows, self-employed women, *Asha* worker, *Anganwadi* worker, youth, women SHG members, village heads, religious leaders and representatives from financial institutions were conducted to understand and analyze the broader perspective of the issue and examine the hurdles faced by women in protecting

their livelihoods and finding out some of the elaborative measures/mechanism that could be adopted to alleviate their concerns related to their entitlements.

It was observed that mostly women had no idea about rights and privileges associated with their work and awareness about various development programmes and welfare schemes offered by the government was missing. The study found that there was no sustainable support system for widows and half-widows and they faced immense problems in dealing with various household and other affairs. It was further alleged that welfare schemes such as Below Poverty Line (BPL) ration cards, Indira Awaas Yojana (IAY), Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) did not reach the needy and deserving. Widow pension provided to the beneficiaries was meagre and they demanded the same to be enhanced and paid on regular basis.

Asha and *Anganwadi* workers did not enjoy proper employment benefits provided by the government, despite putting in hard labour for longer hours. They demanded service rules to be implemented in their favour. SHGs have a potential to inculcate a spirit of entrepreneurship at the grassroot level. This is also the need of hour, especially at a time when need to promote traditional livelihoods and home-based cottage and agricultural industries is immensely felt. Representatives from financial institutions admitted that the major hurdles in bringing schemes closer to affected clusters of the population included lack of marketing facilities. They suggested easy access to market facilities and availability of raw material and finished goods as measures to be adopted to address such hurdles.

Hypotheses Testing

Following conclusions were drawn after hypotheses testing:

S. No	Hypotheses (H_1)	Null Hypotheses (H_0)	Conclusions
1.	SHGs provide a viable option for economic emancipation of disadvantaged women affected by the conflict in Kashmir.	SHGs in its present form has failed to provide a sustainable model of economic emancipation for conflict affected disadvantaged women.	In most of the cases, the loan amount in SHGs was used for non-entrepreneurial activity and in few cases it was used for entrepreneurial activity. Usually, the individual loans were preferred over group-activity. Loan amount was mostly used to meet healthcare expenses, daily family needs, to meet their financial constraints at home and engage in various activities like shawl-making, embroidery work, poultry-farming, construction of a house, paying school dues of their children, etc.

2.	SHGs lead to entrepreneurial activities	SHGs in their present form do not lead to any entrepreneurial activities	Most of the respondents felt financially stable after switching over to SHGs, followed by improvement in decision-making processes at home, information, education and awareness generation, improved expression and exposure visits to the outside world. Very few felt minor changes or no change at all. At the same time, average earnings and savings of SHGs, on the whole, showed no substantial growth over the past couple of years as the group-activity mostly had not gone beyond micro-money saving activities. Thus, they fail to transform into profitable businesses. Marketing and collective/group activity were among the major issues that require to be adequately focused so that these groups become an example of productive micro-units and a useful entrepreneurship model.
3.	SHGs play a significant role in awareness generation, information and exposure	SHGs do not play any significant role in awareness generation, information and exposure	The study proved that SHGs played a significant role in awareness generation, information and exposure. The average number of visits to banks was highest in case of SHGs as compared to other categories of women in the study area. SHG members form the largest interacting group with village heads. Many respondents attributed the formation of SHGs to their improved exposure, information about various issues and rights, an increase in their decision-making role at home, interaction with each other, with banks and other concerned district officials.

4.	Conflict has disturbed the livelihood patterns of conflict-affected, disadvantaged families where the main bread-earning male member is dead or remains untraced.	Conflict has not affected the livelihood patterns of conflict-affected disadvantaged families where the main bread-earning male member is dead or remains untraced.	Most of the widows and youth said that the conflict in Kashmir over the past several years have affected livelihood activity. The conflict affected livelihood patterns in many ways. Some couldn't market the goods, some became unemployed due to adverse impact of conflict on business, and others shifted to other livelihood alternatives. Some even lost the bread earner of the family in the conflict. Most of the respondents said that they were still struggling hard to bring the family back to the way it was when their husbands were alive. The study has shown that livelihood patterns have severely disturbed the education, health and basic needs of the family. Furthermore, the disadvantaged families received no proper support from anywhere.
5.	Power structures like panchayat and socio-economic welfare schemes offered by the government *facilitate* conflict-affected disadvantaged women in creating sustainable livelihood patterns	Power structures like panchayat and socio-economic welfare schemes offered by the government *hinder* conflict-affected disadvantaged women from creating sustainable livelihood patterns	The study suggested that power structures like panchayats, social and economic upliftment schemes offered by the government hinder conflict affected disadvantaged women in setting up sustainable livelihood patterns. The study observed that 61 percent of women interacted with village heads, but 80 percent of them said that these interactions were not useful. Besides, 82 percent of respondents said that they did not receive any support from government schemes which puts these schemes out of the socio-economic upliftment environment for the disadvantaged women.

6.	Low average earnings of women in rural settings in Kashmir	High average earnings of women in rural settings in Kashmir	Average earnings of rural women in Kashmir were observed to be Rs.914 per month, which was less than US$ 0.333 per day.
7.	Financial condition of widows remained worst among all groups of women	Financial condition of widows comparatively was better among all groups of women	The study found that the average earning of widows was Rs.305 per month, which was the lowest among the categories under study.
8.	Income and literacy were related	Income and literacy had no relation	The average income of illiterate women was Rs.596 per month and the average income for the literate was Rs. 2,305 per month. This showed that literacy and income were directly related.
9.	Majority of women employed in private jobs and in the handicraft sector had no job contracts and thus worked in sub-standard job conditions where most benefits were denied to them.	Majority of women employed in private jobs and in the handicraft sector had job contracts and thus worked within standard job conditions where most benefits were provided to them.	Majority of the respondents employed in the private sector had no job contracts and were discriminated against in terms of employment.

CONCLUSIONS AND RECOMMENDATIONS

The study was conducted in twin districts of Baramulla and Bandipora in north Kashmir. Random sampling was adopted and a sample of 288 respondents was taken for the purpose of study. Due representation was given to each and every variable in the study. On the basis of sampling design, 199 samples were taken from Baramulla district and 89 from Bandipora district.

Most of the women interviewed were illiterate and engaged with livelihood activities like carpet weaving, tailoring, pashmina work, *sozni* (embroidery), farming, associated with SHGs, *Asha* and *Anganwadi* workers, school teachers among others. Most of the respondents were housewives and also engaged in various agricultural activities. Many women from the skilled labour work-force worked to deadlines. A shawl/carpet/sweater was to be completed within a stipulated time period. Most of them did not have written employment contracts and all instructions were verbally communicated to them. Even *Asha* and *Anganwadi* workers did not have well-defined appointment orders and they did not enjoy the employment benefits as per the government rules. The skilled workers enjoyed holidays on Fridays and festivals only.

Similarly, *Asha* and *Anganwadi* workers enjoyed holidays on Sundays and festivals only. They got no paid holidays and were not paid travel allowances whenever they conducted surveys. They were not even paid for overtime work. None of them got benefits like free healthcare and yearly bonus. There were also women who earned their living by doing menial jobs like working in others' fields, cleaning rice in the neighbouring households, etc.

The average monthly earnings of the women in the study area ranged between Rs. 1,500 and Rs. 3,000. It was also found during the study that women spent more than they earned. They got money for additional expenditure either from their husbands or sons or by selling poultry products. The average monthly earnings and savings of widows were marginal as compared to other women groups in the study area. Literacy and earnings of women were directly related and literacy was a major deciding factor in the increase in wages. Illiterate women earned less than literate women. Average monthly spending among the women in the study area ranged from 1,600 to 3,000 rupees, with widows showing the lowest (Rs. 1,607) and LWSHG the highest with 3,000 rupees. Most women especially widows and women with professional and post-graduate degrees took their own decision on their earnings.

Women employed in the handicraft sector often worked under harsh conditions. Majority of them had no written job contracts and worked on low wages with no benefits at all. Majority of women (61 percent) in the study area knew about SHGs, but they could not say if SHGs could become a sustainable source of financial support for widows. Majority of the women who were associated with SHGs however, observed that SHGs made them financially stable, gave them voice, respect, decision-making power, education, information and awareness. The study further observed that women SHG members were more interested in taking loans at an individual level than working collectively on a particular group activity.

Though majority of women (61 percent) in the study area interacted with the village head/power structures, but most of them did not find these interactions useful. They mostly interacted with respect to various government welfare schemes such as IAY, MGNREGA, widow and old age pension and scholarship for children. About 72 percent of women in the study area had information about various government welfare schemes and programmes, but 82 percent of them said they received no support from the government. Various government schemes availed by women in the study area included: MGNREGA (33 percent); scholarship for children (29 percent); widow/old-age pension (25 percent); IAY (21 percent), loans (4 percent) and 39 percent did not avail any of these schemes. While 44 percent of women were satisfied with these schemes, fewer monetary benefits and a need for enhancement were constraints stressed by 39 percent and others thought it to be cumbersome and time consuming (15 percent), still others felt it invited gender-based exploitation (10 percent) and some others observed that they could not avail it as bribe was demanded (5 percent).

Most of the widows and youth believed that conflict in Kashmir over the past more than two decades had adversely affected their livelihood patterns. Some had lost the bread-winner of the family to the conflict, others could not market their goods, some lost their jobs due to the effect of conflict on business and others shifted to alternate livelihoods. In case of families directly affected by conflict, there was greater number of child labourers, an increased dropout

rate from school, frequent health problems and severe financial constraints making it hard for them to make two ends meet. Some women were still struggling hard to bring their families back to conditions that prevailed when their husbands were alive.

Based on the findings of the study, some recommendations are put forth:

- Government schemes should be made equally accessible to all, especially to poor and deserving. These schemes need to be periodically reviewed based on field performance measurement.
- Free and fair distribution of BPL cards, jobs under MGNREGA, IAY, widow and old age funds must be made available to the deserving. Transparency and accountability in such cases should be maintained and regular follow-ups conducted.
- Awareness camps about various welfare schemes offered by the government and the Right to Information (RTI) Act should be regularly held.
- Job contracts to *Asha* and *Anganwadi* workers should be more detailed and should list all conditions and allowances they have to work with. The salaries of *Asha* and *Anganwadi* workers should be paid like other government employees well in time. There should be overtime and bonus clauses in their job contracts.
- The government must come up with a better rehabilitation framework for widows and other disadvantaged women in the society.
- Some sort of job contracts to be devised for women in private/handicraft sector to develop transparent and effective work culture.
- SHG members should be helped to market the goods they produce.
- Loans to non-group members in case of SHGs should be discouraged. It could hamper group activity, especially in the times of crisis. The maximum amount that can be provided as individual loans in the SHG should be set and strictly followed.
- Collective/group activity of SHGs should be encouraged. This would go a long way in strengthening the entrepreneurial spirit among the women.
- Interactions with successful entrepreneurs, bank officials, government officers, non-government organizations should be encouraged. This would go a long way in establishing and strengthening networking that would facilitate entrepreneurial activities within the Valley.
- SHGs should focus on entrepreneurial activities. Their performance should be measured against clear business parameters like profitability. SHG members should be drawn to this model based on their interest as this will ensure commitment. The use of group funds in non-entrepreneurial activities should be strictly discouraged.
- The SHG model should be tuned to local conditions based on feedback from local business models.
- Prior to starting an SHG, the members should be counseled about pros and cons of the activities and guided on the activity they have to focus on.

- Field visits of SHG members, youth, etc. to be conducted within Kashmir Valley so that they get first-hand information about the overall situation. Face-to-face interactions with scientists at Sher-e-Kashmir University of Agricultural Sciences and Technology (SKUAST), officials at Department of Agriculture, Floriculture, Sericulture, Horticulture, etc. should be periodically organized to build and strengthen linkages.

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PROTEST POLITICS OF RURAL CRISIS

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ABSTRACT

This paper tracks down the features of struggles of the Indian rural workers in the colonial and post-independence times. The study unravels their constancy of desperate fight against rural crisis as the problem of unemployment and poverty. The study also examines the failure of the left movement predominantly fighting for their cause in effectively organizing them to be a potent force to overcome the worsening rural crisis.

Keywords: Colonial times, Left movement, post-independence phases, Protest politics, Right to work, rural crisis.

INTRODUCTION

About 75 percent of the Indian poor lives in rural areas and most of them are landless daily wagers or marginal farmers belonging to the Scheduled Castes, Scheduled Tribes and Other Backward Castes. Their families, especially the women among them, have borne the brunt of the rural crisis in terms of unemployment and poverty. Pratap and Bose (2015) have examined the emergence of the discontents and protests of the workers of rural and urban India

Much scholarly writing exists on the changing economic basis of the rural crisis since the colonial times (for example, see Byres 1981; da Corta and Venkateshwarlu, 1999; Patnaik, 1999; Patnaik, 2006; RUPE, 2008; Sainath, 2009; and Pratap, 2010). However, the politics emerging from the rural crisis has not been critically evaluated, and this is the concern of this paper. Leftist academics offer a good analysis of the crisis-reality but fail to frankly assess the divisive Leftist intelligence and politics of change.

Anti-feudal struggles characterized the rural protests in colonial India. The post-independent India has seen five phases till now in the protest politics of the Indian countryside. The first phase extending up to the first half of the 1960s was in continuity with the colonial struggles. There was no initiative to build a proper agricultural labour movement. The second phase from the second half of 1960s to the early 1980s saw some interesting developments for the working class movement alongside the transformation of the Indian economy, polity and society. The third phase of post-1980s witnessed a downfall in the agricultural labour movement. The

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fourth phase coincided with the implementation of the National Rural Employment Guarantee Act (NREGA) in 2005 and the rise of the NREGA unions. And the fifth phase applies to the state of beggary under Covid-19 conditions. We elaborate the second to fifth phases in order to arrive at a cogent conclusion, on behalf of the rural workers.

COLONIAL TIMES

According to the International Labour Organization(ILO), the number of agricultural labourers increased from 21.5 million in the year 1921 to 31.5 million in the year 1931, out of which 23 million were landless agricultural labourers.

The political forces engaged in anti-feudal struggle were largely opposed to separately form agricultural labour unions, mostly out of the fear that it might be detrimental to the unity of the rural workers in waging the anti-feudal struggle. There were debates in this regard among the activists engaged in this struggle, particularly in the Akhil Bhartiya Kishan Sabha.

For historical politico-economic reasons, not elaborated here, the agricultural labour movement first emerged in Kerala and Andhra Pradesh and many agricultural labour unions emerged during the period 1937-40. Babu Jagjivan Ram of the Indian National Congress formed Bihar Provincial Khet Mazdoor Sabha in 1937. And earlier in 1936, Dr. B.R. Ambedkar formed the Independent Labour Party. These developments further intensified the debate on the issue of organizing agricultural labour into separate organizations other than like the Kisan Sabha and building their separate movement to advance the cause of wage workers, while simultaneously strengthening its unity with the peasant movement in the anti-feudal struggle.

In the Gaya Congress of All India Kishan Sabha in 1939, this issue was discussed and debated and the resolution was passed to raise the demands of agriculture labourers and establish friendly contacts of peasants with agricultural labour unions wherever they were formed, but there was no call for organizing the agricultural labourers.

Swami Sahajanand was probably the first leader of the anti-feudal movement who raised this issue systematically in his book *Khet Majdoor* that he wrote in Hazaribagh jail in 1941CE. He clearly argued for a separate organization of agricultural labourers and poor peasants, and emphasized its importance in terms of strengthening the anti-feudal struggle. However, the peasant movement largely opposed or discouraged the formation of separate agricultural labour unions and argued for organizing them into Kisan Sabhas only in the name of maintaining all peasant unity in the anti-feudal struggle.

It is a well established fact that the Communist Party and other left forces were leading the anti-feudal struggles in India and credit indeed goes to them for whatever that could be achieved in terms of abolition of feudal exploitation and abolition of Zamindari system and thereby also bringing some light into the dark life of the oppressed castes. The communist forces were well grounded in the oppressed sections of rural masses and the oppressed castes were the closest allies and actually the lifeline of the communist party. But probably because of its above erroneous understanding and erroneous strategy of forging all peasant unity in anti-feudal struggle and not organizing the agricultural labour separately, it was unable to

fully understand the caste issue and was unable to build a movement targeted towards caste annihilation. This should have taken place because the agricultural labourers were dalits (and Other Backward Castes). However, since the anti-feudal struggle was for the abolition of Zamindari system of land relations, the main demand was for land reforms that promised *Land to Tillers*--sanctioning ownership of land to the tenants, and providing land to the landless. Therefore the landless agriculture labourers were treated as the landless peasants. Sahajanand Saraswati called the landless workers as the '*poorest and propertyless kisans'* even when he was advocating for separate organization for agriculture labourers; and by all means he was right. Indeed they were landless peasants and they were part of Zamindari abolition struggle, but they were wage- workers and exploited by the same peasants that were leading the organization and struggle for Zamindari abolition. The agrarian relations became more exploitative because of the caste division between the rich and the middle peasants on the one hand and agricultural labour on the other.

As already mentioned, almost all the agricultural wage workers were dalits, adivasis and other backward castes. But the rich and middle peasants that engaged them were mainly from the upper castes and only a very small number from some backward castes. And these peasants were actually leading the Kisan Sabhas and the anti-feudal struggles. In such situations, it is but natural that even when the agricultural labourer played a very important role in anti-feudal struggles, their voices were not significantly represented in the movement.

INDEPENDENT INDIA

Second Half of 1960s to Early 1980s

This period was most precious for the Indian working class movement and transformation of Indian economy, polity and society. We can list some of the important developments as follows:

1. Anti-feudal political movement reached its culmination in the second half of 1960s. It was largely defeated, followed the path of left adventurism, faced unimaginable repression and finally got scattered in various political tendencies within the broad radical Left.
2. A more popular movement emerged in the first half of 1970s which later developed under the leadership of Jayprakash Narayan. It was a reflection of the crisis both of the India economy and the international economy. The so-called JP movement was actually a wave of struggles, and spontaneous movements in both rural and urban areas mainly led by the left and socialist forces. There were a series of historic strikes in public sector like railways and post offices etc., in private sector like in textile industries, etc. The movement was so strong that the government was compelled to declare the draconian Emergency rule. However, with the imposition of Emergency, the movement got further widened and intensified. But also in many ways it was derailed because the real issues were lost and the opposition political parties successfully transformed the movement just to change the regime. The far right forces who were earlier opposing the left political forces--the socialists and communists providing leadership to the wave of struggles-- also became part of the JP movement.

3. A strong Dalit movement also emerged in the 1970s almost all over India, under different names like: Adi-Dharma Movement in Punjab, Namashudra movement in Bengal, Adi-Dravida movement in Tamil Nadu, Adi-Hindu movement in Kanpur, Pulaya movement in Kerala, Untouchable movement in Maharashtra, Dalit movement in Karnataka and so on.
4. The Zamindari system of agrarian relations was abolished and capitalist development of agriculture was accelerated. Green revolution brought a sea change in terms of transformation of agriculture and in the second phase of green revolution probably from the second half of the 1970s, the mechanization of agriculture was also accelerated. A large number of projects were started to develop infrastructure facilities in rural areas like irrigation, electrification, roads, schools, and also the infrastructure projects spearheaded by the local elected councils and bureaucratic administrations. On the other hand the industrialization drive also was accelerated. All these developments created large opportunities for rural wage labour and increased their collective bargaining power.

All the above four factors discussed, played a role in abolishing the Zamindari system and realizing the freedom of Dalits from feudal obligations. Development of capitalist agriculture on the one hand, and increasing opportunity of wage work outside agriculture on the other played an important role in the abolition of attached/bonded labour system in agriculture. Periods of these developments were different in different states and regions but this occurred sooner or later in all regions. This was experienced as a real freedom by the Dalits and was reflected in a series of spontaneous strikes of agricultural labour in rural areas in some regions in the late seventies, in some in the early eighties and in some in the late eighties. It is interesting to note that in Punjab the agricultural labour movement emerged in the 1960s itself because of early capitalist development in the Ryotwari regions (as against Zamindari system of land relations) which also later developed as the Green Revolution belt. But even when Haryana and western Uttar Pradesh fell in the same region and with same system of land relations, agricultural labour movement in these parts emerged only in the 1980s.

There may be several factors behind this, but a more important one was the practice of attached labour system in Haryana and western UP that in a way was responsible for persistence of the feudal obligations for a longer period. The attached labour system gradually went out of practice only in the 1980s, and therefore we observe the emergence of agricultural labour movement in Haryana in the 1980s. It is worth remembering that here some of the great movements of agriculture labourers were led by the Bhartiya Khet Majdoor Union (BKMU). A countrywide campaign and struggle was launched by BKMU in 1978, against atrocities and social injustice in relation to Harijans, Adivasis, rural poor and other agricultural workers in which twenty lakh agricultural workers participated. During the same period, a historic march of five lakh agricultural workers was organized and a charter of demands on the issues of agricultural labour was presented before the Parliament. A countrywide land struggle was launched in 1980 in which thousands were arrested and 12 persons lost their lives. One-day general strike of two million agricultural workers was organized in 1982, demanding a comprehensive central legislation for agricultural labour. BKMU along with other agricultural labour unions organised one-day general strike simultaneously on July 15, 1983 in which more

than twenty lakh workers participated demanding a comprehensive central legislation which shall include: (a) trade union rights, (b) employment guarantee and unemployment wages, (c) payment of pension, (d) equal wage for women, and payment of maternity allowance, and (e) a separate Labour Department for agricultural workers.

It is in this phase that the demand for Central legislation for agricultural workers was raised. Kerala was the first state to legislate Agricultural Workers Act in the year 1974. A central Agricultural Workers Bill was drafted in the year 1981. However due to strong opposition from some political parties, central legislation for agricultural workers could not be enacted till date. In the year 1982, State Governments were directed by the central government to plan appropriate legislation to regulate the working conditions and to provide for the welfare of the agricultural workers. However, only one state, namely Tripura responded to this and enacted the Tripura Agricultural Workers Act, 1986. The struggle for central legislation for agricultural workers continued all the same.

Post-1980s

However, there was a downfall in the agricultural labour movement after the 1980s. There could be various factors behind this, but, to us, the most important factor seems to be the development of capitalist agriculture to a new stage wherein the agricultural operations were increasingly mechanized and managed in such a way that routine wage work in agriculture was almost lost and availability of wage work became largely seasonal. In 1990s itself, the wage work in agriculture was available for not more than 100 days in a year and thereafter it decreased further.

This situation led to the following phenomena:

1. Agricultural labour acquired a new identity of rural labour doing various kinds of wage work in rural areas including agricultural wage work.
2. Migration of agricultural wage workers, both on day to day basis to nearby urban centers and on seasonal basis to distant places started taking place.
3. A reserve army of agricultural labour was created by way of feminization of labour (women stayed at home while men migrated) and in the form of semi-proletariat (i.e. people with small land holdings and always ready to do wage work whenever available).
4. This situation changed the rural labour market also. The agricultural labour market which was village based and collective bargaining which was therefore village based lost their significance. Now onwards rural labour was working in various occupations in whichever surrounding villages or urban centers wage opportunities were available to take up.

In such a milieu, organizing the unorganised agricultural labour became difficult, and it required a change in the strategy of organization as also struggle. Actually the demands raised by the agricultural labour unions in the 1980s as discussed above were already addressing these issues and framing their demands to target the new situations: for example, the demands for minimum wages, employment guarantee and unemployment wages, payment of pension, equal wage for women etc. However, organizing the rural workers increasingly became a difficult task, and there was no breakthrough for a long time.

Post-2005 NREGA Unions

The above situation started changing only after the implementation of National Rural Employment Guarantee Act (NREGA) in 2005. For the genesis and main elements of this Act and its specific features in terms of rights-based programmes, transparency and accountability and creation of durable community assets, and critical evaluation of its successes and failures, see Pratap (2010a and b).

It is to be noted that with the differentiation of peasantry and proletarianisation, a large number of poor peasants and wage workers have emerged in almost all caste categories. Among high caste Hindus also, a significant section now falls in the category of poor peasants. But due to the caste pride they do not prefer to do wage work in rural areas and they migrate to nearby urban centers or the cities. Rarely do we also observe some high Hindus doing wage work in rural areas. Among backward castes, a significant section of population is now doing wage work along with cultivating small farms.

It is also interesting to note that the poor high caste Hindus are also reported to be working in NREGA works, because it is not considered as bad as doing wage work in someone's farm. NREGA provides an employment guarantee for 100 days in a year to one member of each rural family and there is no condition of anything like poverty line. Therefore, it provides an opportunity to organize poor peasants and landless wage workers across the caste categories at the village level. As such it is not only an opportunity for revival of the rural labour movement but also to build the unity of the poor peasants and landless wage labourers across the caste lines. It may indeed be a significant step towards breaking the barriers of the caste relations and moving towards caste annihilation.

There is also immense scope for revival of rural labour movement by way of organizing the rural workers around employment rights under NREGA. The democratic structure and functioning that is promised in the NREGA (and that can be made a reality only if the organized force of rural workers appears on the stage) provides ample opportunity for organizing democratic movements of rural workers at village level to democratize the panchayats and make them the people's councils in real sense of the word.

NREGA unions have started emerging across the country and along with fighting for effective implementation of the Act; they have also started raising the demands for increasing the wages, and increasing the days of employment etc. There are also demands for extending the scope of NREGA works, and for considering NREGA workers as construction workers and therefore extending the benefits of construction workers' welfare schemes to NREGA workers. It is generally agreed that the recent growth in the membership of central trade unions came from the informal sector and largely from the NREGA unions.

Now the following downside development is very disturbing. The World Bank is against NREGA and other such pro-people policies like the watershed programmes and schemes for development of small and medium towns as it says these are policy barriers hurting economic development and poverty alleviation (World Bank, 2009). This was a good enough signal for the ruling central government to slash the budgetary allocations for NREGA.

In any case the NREGA unions have also known that this scheme has been systematically crippled in the last six years not only with budgetary cuts but also with long wage payment delays and non-payments. On top of this, a centralized technology linked implementing mechanism has wrecked the local accountabilities and participation of the representatives of the elected Gram Panchayat in the scheme. This scheme was originally expected to be implemented as per the recommendations of the Gram Panchayat, Gram Sabha and the Ward Sabha. But the NREGA works have instead been executed according to the priorities of the government. The NREGA workers are used to work under schemes such as the Pradhan Mantri Awas Yojana, Swachh Bharat Mission and construction of Anganwadi Centres, whereby the government is getting assets like houses and toilets without paying minimum wages to the workers (Nandy, 2020).

Covid-19 Disaster

The nationwide lockdown imposed to curb the spread of the novel corona virus disease has left the NREGA workers in the lurch. They have much become workless and are facing starvation. This problem has become all the more pathetic with the influx of migrants returning from urban areas to their village homes.

On June 29, 2020, the workers from across the country, from 108 districts across 12 states, staged a peaceful demonstration and observed the day as "NREGA Adhikar Diwas" under the banner of the Mahatma Gandhi NREGA Sangharsh Morcha. They demanded 200 days of employment per person and daily wage rates to be increased to Rs. 600 per day commensurate with the Seventh Pay Commission.

All this now turns out to be a cry in wilderness.

CONCLUSION

No Right to Work

There is no right to work in India. In other words, the ruling governments have been least bothered about full employment policies and practices in independent India. The Indian Constitution does not explicitly recognize it as a fundamental right. It is cleverly placed in the Directive Principles of State Policy, which hence makes it unenforceable in the court of law. The Supreme Court of India, through a judicial interpretation, recognized it as a fundamental right inherent in the 'Right to Life' under Article 21 of the Constitution. However, this does not enable a person to sue the State for not providing him with a job although he can challenge the deprivation as offending the Right to Life conferred by Article 21 of the Indian Constitution (Thomas, Undated). This kind of legalism is of no relevance to the disadvantaged and socially discriminated majority dying without work and living wages in the country.

The NREGA as a pro-people policy that came into existence as a consequence of a long struggle supported by the left forces supporting the Congress government at that time, does not guarantee full employment to every individual. It is now more likely in its death throes even as the rural workers are now begging, under Covid-19 conditions, for 200 days of employment guarantee for each adult at increased wages a day. Average days of employment provided per household has declined to 38.06 days in the year 2020-21 against a guarantee of 100 day per year.

Failure of the Left Movement

In this unfolding scenario, the Leftist forces have shown incredible appetite for endless debate on organizing the rural poor without contributing to Indian development based on full employment and domestic-demand-led economic growth. It is interesting to note that during the process of splits in the left movement, those parties which were declared revisionist took a right direction on this issue and started organizing agricultural labour separately and formed national level unions; whereas, those declared as radical continued working with their position of organizing rural workers and marginal farmers so as to complete the task of anti-feudal struggle. During the first split in the communist movement in the year 1964; the mother party, the Communist party of India (CPI) was declared revisionist and the newly formed Communist Party of India (Marxist)--CPI (M)--was declared radical. In the second split in the year 1967, the Communist Party of India, the mother party CPI(M), was declared revisionist and the newly formed party CPI (Marxist-Leninist) was declared radical. The CPI (M) started organizing agricultural labourers and formed the All India Agricultural Workers Union in 1982. The CPI (Marxist -Leninist) later got splintered into various parties and groups and the largest party in the name of the CPI ML-Liberation was declared revisionist sometime in the 1980s, and CPI ML-Liberation formed the All India Agricultural Labour Association in the year 2003.

It was clear that on the one hand, by entering the parliamentary politics, these parties were compelled to realize the importance of agricultural labourers as a separate-social political force and vote bank and accordingly they were focused on developing separate agricultural labour unions. On the other hand, numerous left groups with radical ideology (other than those Naxalites/Maoists engaged in armed struggle), which are well-grounded in rural areas by actually working with poor peasants and agricultural labourers, are still persisting with the same colonial position of anti-feudal struggle and thereby they are not engaging themselves in organizing rural labour into a united union. Thus, the left forces with their divisiveness and confusions have failed to effectively take up and strengthen the cause of rural labour against rural crisis in terms of unemployment and poverty.

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ROLE OF SOCIAL MEDIA IN TEACHING AND LEARNING PROCESS:

An Overview of Lockdown Period due to Covid-19 Pandemic

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ABSTRACT

The swift advancement in the modern technology has brought new phase in social communication by the invention of social media technology which establishes new social communication platform between families, friends, relatives and the people in general. However, the use of social media is rapidly increasing which counterbalance all human activities and allow people to exchange, create information, discuss and share knowledge in a collaborative manner. Thus, social media is an important tool which alter communication landscape and its impact significantly affects student's way of learning as well as the way teachers teach. Today, education sector is at the forefront in benefitting from the social media technology which brings a new trend in the realm of education sector, for its implication in teaching and learning process. However, the outbreak of covid-19 pandemic which resulted in the enforcement of law to administer temporary total lockdown by the governments of many countries of the world has changed almost everything from its normal outlook. The decision was taken with a view to control widespread corona virus pandemic, but it has badly affected all sectors. Education in particular was seriously affected as almost all schools were closed in an attempt to contain the spread of the virus and maintain social distances. This closure of schools, colleges and universities ceased all academic activities and as such make it necessary for government, educational administrators, teachers and scholars to find out an alternative means that will supplement the face-to-face mode of teaching and learning. It was at this point, social media has been recognized as an alternative means for teaching and learning during the Covid-19 lockdown to replace the physical contact mode. This paper aims to find out the role and impact of social media in teaching and learning process during the lockdown period. Meanwhile from the data collected, it is concluded that social media played a significant role in teaching and learning during the covid-19 pandemic.

Keywords: Covid-19,Learning, Lockdown, Social Media, Teaching.

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INTRODUCTION

In recent years, interaction between humans has completely changed with the appearance and development of computers and networks. Social relationships are going to start at the beginning of the web. People communicate; build relationships using social networks (Bandura, 1989). In other words, social media has been seen as an essential tool that brought fundamental socio-structural changes in all human lives, it has further revolutionized communication tools for facilitating teaching and learning process. However, the recent closure of schools, colleges and universities due to Covid-19 pandemic necessitate making a paradigm shift to adopt social media in teaching and learning process. The adoption of social media explores the discovery of its potentials in drastically transforming the pedagogical basis of teaching and learning and at the same time gives teachers tools that they can use to create truly adapted and flexible mode of teaching to facilitate better result.

The use of social media during Covid-19 lockdown has created a platform for the improvement of educational process because of its flexibility, ease of use, individual affordability. It also provides communication among teachers and students regardless of the distance, making it open to all and provides ease in sharing information, files, pictures, videos as learning contents from teachers to learners. Moreover, teaching and learning become solely reliable on social media platform at all levels of education in the lockdown period and it has played a vital role in sustaining education sector. In other words, one can outrightly say that without social media, education sector would have deteriorated during the lockdown. Social media is the only platform that can save education system and process. Social media provide learners with access to information and make their overall learning process very interesting and engaging. Social media platforms like; LinkedIn, Facebook, You Tube, Twitter and Instagram are used to share and generate knowledge content during teaching-learning process. It also empowers students and educational institutions with opportunities to improve teaching-learning process. It is the only reliable medium during the lockdown where students can establish beneficial connection for their careers and in the same vein help educational institutions to create better student engagement strategies and make learning more interactive and inclusive. It also extends and enhances the scope of learning beyond classroom settings and as such increases outreach of academic post of ideas, views, new trends and updated useful information in education system. Thus, social media helps both teachers and students to remain connected off-campus during the lockdown. (Rahul Jain, 2020).

SOCIAL MEDIA DEFINED

Social media is a term that has been defined in so many ways by different scholars, for example Boyd and Ellison, (2008): "Social media has been defined as a platform to create profiles, make explicit and traverse relationship". "It is a category of sites that is based on user participation and user-generated content. They include social networking sites like LinkedIn, Facebook, or My Space, social bookmarking sites like Del.icio.us, social news sites like Digg or Simpy, and other sites that are centered on user interaction (Lazworld, cited in Chris Lake, 2009). In other words, social media is viewed as an "online technologies and practices that people use to share opinions, insights, experiences and perspectives with each other." (cited in Chris Lake, 2009).

According to Capilanou(cited in Chris Lake, 2009) "social media are works of users-created video, audio, text or multimedia that are published and shared in a social environment, such as blog, wiki or video hosting site." In this vein, social media refers to that medium of communication that can convey message, information, knowledge and ideas to large number of audience or users at ease and within a particular time with the aid of technological gadgets.

SOCIAL MEDIA AND EDUCATION

With technological advancement, social media is found as an essential technology product that can impact on education. Social media can be used in education system and process to bring desirable outcome. The mode of admission, entrance examinations, assessment strategies, educational records, research process to mention but few requires the application of social media to make things simple and at ease. In addition, social media can also enhance learning management systems, establish communication medium between institutions and students, build social credibility among learners.It also affords students and educational institutions with multiple opportunities which can be effectively utilized to produce desirable impetus and improve learning methods. Hence, education achieves another remarkable development and witness a new trend through the use of social media which transform the entire education system and process as well as make education as a discipline more suitable, desirable, generic, more standard and open to all irrespective of status, gender, location and qualification. It also helps education process in making sharing and accessing of knowledge contents easier and simple thereby make education cost effective such that even less privileged and weaker section of the society can afford and access.

TEACHING AND LEARNING DEFINED

Put simply, teaching is an intimate contact between a more matured personality and a less matured one which is designed to further the education of the latter. (H.C. Morrison, 1934). According to Amidon (1967), "teaching is defined as an interactive process, primarily involving classroom talk which takes place between teachers and pupils or learners and occur during certain definable activities." Joyce and Weil (1985) defined teaching as "a process by which teacher and students create a shared environment including set of values and beliefs which in turn color their view of reality". In another definition "teaching is a form of interpersonal influence aimed at changing the behavior potential of another person." (Gage cited in Rajani Raji, 2011). Thus, teaching is a set of activities designed to impart knowledge to the learner with a set of objectives of achieving self-actualization and emancipation.

While, leaning on the other hand, occupies an important place in education, it is regarded the essence of enrolling into schools, colleges and universities, thus it is an integral part of educational process. Malcolm Knowles viewed learning as "the process of gaining knowledge and expertise" (cited in Connie Malamed, 2019). It is also defined as "relative change in a person's knowledge or behavior due to experience". This definition consists of three main components: the duration of the change, the locus of the change and the causes of the change in the behavior of the learner. (Richard E. Mayer cited in Connie Malamed 2019). F.S Freeman (1958) observed that "learning is the process of developing the ability to respond adequately to a situation which may or may not have been properly encountered."

Both teaching and learning are two related concepts in social process settings. While teaching aims at instructing someone as to how to do somethings or knowledge imparting, learning is enrichment in knowledge and experience in the learner and it is the product of the latter. Thus, the two concepts cannot be separated; one cannot be divorced by the other. Subsequently, the two concepts are significantly influenced by the social media and turn them into another dimension. The mode of teaching and learning have realized a significant transformation as a result of advancement in technology primarily through the application of social media in enriching the two concepts. However, this transformation portrays the need and importance to review the meanings and definitions attached to both concepts as some new ideas, element and discoveries need to be included to ensure adequate conceptualization of the two terms so that young growing generation may have better understanding of the terms and in order to go hand in hand with present world of technology.

ROLE OF SOCIAL MEDIA IN TEACHING AND LEARNING PROCESS DURING COVID-19 PANDEMIC

The use of social media before the pandemic process was at normal level as individuals use it to spend their leisure time, spare time outside their work with low number of users who use it wisely for academic purposes. But during the pandemic, the enforcement of law to stay at home in the name of temporary lockdown enforced by the government made people to stay constantly at home, none going out for work except few government officials who had been charged with responsibility of ensuring abiding of laws by citizens and except for emergency purpose.However, during this period people with enough time at home and having nothing to do, shifted their attention to make use of social media for entertainment, spent their time and perform some work that can be done with the use of technological gadgets. It was at this juncture that the social media played a major role in educating, enlightening, and entertaining the teeming populace as well as keeping them busy during the lockdown. Nevertheless, the lockdown also influenced the closure of all educational institutions in most countries as such social media was a medium championed to supplement the physical interactions between teachers and learners. In fact, all educational activities; academics and non-academics re-shifted to social media platform because of the lockdown.

During the Covid-19 pandemic, social media sites become the major means of communication and mode of teaching and learning in education. Thus, social media has gained incredible popularity during the pandemic as an open source of information and knowledge sharing platform. Educational institutions are using social media space to carry out some important educational activities such as interacting with young minds, scholars and professionals through webinars, web conferences and overall teaching-learning processes. Hence the role of social media in teaching-learning process during the pandemic cannot be ignored, it provides students with access to useful information and in the same vein, connect them with learning groups and other educational system that make their overall learning process more interesting and more engaging. (Rahul Jain, 2020).

However, as the social media become more integral part in teaching and learning process in the lockdown period, it has caused major impact over the educational system and process with particular reference to teaching-learning processes in the following manner:

1. Supplements the Face-to-face Classroom Interactions

The major role of social media in teaching and learning during the Covid-19 lockdown is that it supplements the physical contact between teacher and learner thereby channeling all educational activities to be conducted via social media platform. This has gone a long way to ensure the sustainability of educational programs even though the schools were closed. Thus, social media play an integral part in making teaching and learning possible during the lockdown period

2. Ushers Paradigm Shift to Collaborative Learning

Unlike conventional setting where the teacher usually dominates the discussion, the use of social media in teaching and learning allows for exchange of ideas, information and knowledge between teachers and students and among the students themselves. In essence, social media play an important role in encouraging and improving collaborative learning giving students courage to forge international partnership to take up some academic activities such as assignment, projects etc.

3. Leads to rise of E-learning in Teaching and Learning

During the lockdown period the use of social media in teaching-learning process distinctively increases as an alternative to conventional classroom settings. In this manner, social media plays a major role in ensuring teaching and learning delivery and makes educational process via social media duly sustained and maintained. However, students found social media very useful during the pandemic as an essential tool for accessing the learning material thereby makes learning more effective and easy to access

4. Fosters Research Initiatives

Due to the Covid-19 pandemics, research scholars, academicians and professional from different field of study embark on conducting researches on the impact of the pandemics on human endeavors. In this regard, social media offers collaborative opportunities in fostering research initiatives. Most scholars during the period conducted their research through the use of social media in sourcing relevant literature for review. It also serves as technique for data collection using online questionnaire. Similarly, social media remain central in analyzing the data through the use of SPSS software as well as plagiarism detector.

5. Makes Teaching and Learning Accessible Anywhere and Everywhere

Consequent to the closure of schools, colleges and universities due to the Covid-19 pandemic, social media plays a key role in making teaching and learning accessible even during the lockdown. In other words, it offers ample opportunities to have access to teaching-learning at anywhere and from everywhere. The teaching hours can be extended beyond classroom hours so that students can have access to learning without any restriction during the pandemic.Moreover, students can also extend their learning hours because they are at home not facing any time constraints and travel challenges, this can help them to academically achieve more (Rahul Jain, 2020).

6. Improves Students' Academic Performance

The use of social media in teaching and learning help learner to become autonomous in learning. Conversely, the learner is at liberty to choose when and how to engage in learning.

They also have ability to access different social media sites in search of different information about a particular topic and this allows learner to have general knowledge about a particular phenomenon unlike in the face-to-face classroom where his experience is only confine to what teacher teaches. Therefore, the learners' ability to access different literature using social media platform may help them achieve better in their academic pursuance.

7. Help Assess Students Learning

Teachers can take advantage of social media platform and assess students learning during the lockdown. Students can be instructed to make use of Snapchat to summarize the learning contents. Likewise, live streaming via zoom chart, Facebook, Imo, You Tube among many others can be used to assess students learning. The feedback the teacher obtain so far can be used to measure students' performance on that particular subject or topic.

Moreover, the benefits of social media for academic entities during the lockdown period are numerous, the aforementioned list above are very few. When social media sites are effectively used in pedagogical process, students who have difficulty in expressing their thoughts in the classroom can get involved in the learning process. It helps build their learning confidence. Social media gives students freedom to collaborate and become connected to scholars outside their institutional boundaries with a view to gain more knowledge and diversify experience. Educational institutions however found social media as answer to problem of educational process because it offers many values to education system. Social media was used in teaching and learning and in conducting other educational activities intensively during the lockdown. However, the utilization of social media during the Covid-19 pandemic has brought positive result in sustaining the status quo of educational process and save it from deterioration otherwise educational sector cannot answer anymore because the temporary lockdown has led to closure of all educational institutions in many affected countries of the world and all educational activities were ceased off. If not for the social media, education sector had no other alternative to re-shift its activities during the pandemic period.

CONCLUSION

Advancement in the social media networks have positive impact on education system by advancing beneficial tools that can make learning more interesting and provides enriched experience. The use of social media during the Covid-19 pandemic has immensely helped in educational process. Teaching and learning process become liable to social media platform because all educational institutions were closed as enforced by government in many client countries to accommodate and curb the corona virus from extensive spread among citizens. During this period, all educational enterprises were put to an end. It was in this point that social media was used as a last resort in education to put back education process.

However, social media played a major role during the lockdown in blending learning and support enthusiasm in a common space around sharing interest, collaborations, resource sharing, communication and interactions. It also helps teachers to communicate instantly and directly with students and compare curriculum, notes, teaching methodology among others. Hence, social media has changed the way the world of education feature during the pandemic, it also changed the traditional mode of delivery and allows students to develop initiatives and

cognitive ability in learning. Thus, there is no gainsaying that social media play a key role in sustaining, improving, developing, enhancing and supplementing teaching-learning process during the Covid-19 lockdown across many countries of the world (Rahul Jain, 2020).

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AN APPLICATION OF STUDENT DATA TO FORECAST EDUCATION RESULTS OF STUDENT BY USING CLASSIFICATION TECHNIQUES

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ABSTRACT

Education is necessary for every person to live a near-flawless life. It helps to grow in a profession and make their dreams come true. It also assists one in setting career objectives. The significant issue, institutions of higher learning face in recent decades are the tremendous growth in educational data and the use of this information collected to raise the quality of managerial decision- making. Work with EDM is aiming to uncover secret trends in educational data. Classifiers like decision trees, SVM, LDA and so on, can be implemented to the higher education data in order to predict the actions of the student, examination results and so forth.

This forecast can support the faculty members to recognize the students who are poor and helping them achieve better test scores. The student descriptions were taken for study at the CCT college, and data mining techniques were employed to obtain valuable information. This paper has demonstrated the diverse academic data mining approaches which direct the authorities to understand and improve the performances of students.

Keywords: Classification, Data Mining, Educational Data Mining (EDM), prediction.

INTRODUCTION

Data mining is data and result-analysis methodology used to identify hidden patterns in a large data set. EDM is an emerging field which can be effectively applied in the field of education. For the higher education institutions to enhance their quality, it is a must for them to extract a substantial amount of hidden knowledge. EDM extracts are useful, previously unknown patterns from the educational database for better understanding, improved educational performance and internal evaluation of the student process of learning. Though, performance prediction is a complex issue, which can't be restricted for the grading. The classification algorithms can be used to classify and analyze the students' data set inaccurate manner.

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Figure 1. Steps of the Proposed Methodology

Figure1 explains the different stages of our proposed methodology for mining information on educational data for academic decision making. In this paper, the classification task is employed to gauge students' performance and deals with the accuracy, confusion matrices and the execution time taken by the various classification data mining algorithms.

This document is compiled as shown herein. Section 2 addresses a work related to it. Section 3 provides a Preprocessing of Information, and explains the concept of classification as well as describes key elements of the method for classification. Section 4 discusses model development implementation, and describes the findings and the conversations. The conclusion is given in Section 5.

REVIEW OF LITERATURE

The review of the literature indicates that over the last few years, such problems should be of interest to numerous researchers.

Han and Kamber [4] discuss data mining platform that allows users to discover, categorize and sum up data from multiple aspects and the connections defined during the mining phase. Galit [6] gave a study using data from students to evaluate their learning and performance in the ability to forecast results and notify students of threat before their annual examination. Bhardwaj and Pal [8] worked to forecast the student performance at the end of the semester, and collected students' data like their attendance, score of the class test, seminar attended. Thereafter they applied various models. In [2] Zlatko *et al*., has investigated the multiple factors to estimate students who are at risk of failing in the test. The approach clearly implies that the preceding educational outcome plays a significant role in forecasting their present overall result. Bekele and Menzel [1] used the Bayesian networks and used to predict high school senior results. The model categorized students into three sections: wholly unsatisfactory, satisfactory and excellent. Kotsiantis *et al.* [5] also deal with predicting student success, identifying dropout students based on population characteristics, e.g. age, gender and success attributes (e.g. assignment mark concerned). Ramaswami *et al.* in [9] focus on developing data mining method, using the common CHAID decision tree *algo*, to classify slow learners and research the impact of important determinants on their educational outcomes. Anupama Kumar & Vijayalakshmi [3] have used Classification methods such as C4.5 and random forest and predicted academic results during the V semester. The algorithms are analyzed using factors such as correctly estimated number of cases, algorithm accuracy and algorithm precise value.

MATERIALS AND METHODS

Data Set Description and Preprocessing

Feature extraction has become one of the main principles used during machine learning that primarily affects model efficiency. However, according to Refaeilzadeh *et al*. [7] the

efficiency obtained is greatly affected by the extracted features used to train algorithms. It is also termed as the removal of irrelevant features.

A set of data used by this research for performance evaluation was taken from B.Tech course offered by the CCT department of the University Of Rajasthan, Jaipur. Data was obtained from 650 students. Student's educational and personal details were gathered from the student records. The collected information was integrated into a table. Student data consists of different attributes such as gender, age, the total number of absent and present, grade of Term1,2 & 3 and so on. Using feature selection methods such as f-test, chi-square test and so on, among the various attributes initially present, further processing was done. The affecting features are selected and used by the classifiers on Python programming tool.

DATA MINING METHODOLOGIES

Decision Tree

It is like a flowchart which forms the structure of a tree. It consists of an internal node which represents attributes, the branch which represents a rule for the decision, and leaf nodes which represents the outcome. The techniques of data mining can be used in the field of education to enhance the understanding of the learning process to focus on identifying, extracting and evaluating variables related to the learning process of students [10]. The root node is the start node in a decision tree. It divides the data based on the attribute value. The process of division is of recursive manner and so, called recursive partitioning.

Support Vector Machine

It is a supervised learning technique as the input and output are both presented to the machine in the form of a training dataset. The results are further used to forecast the outcome of the testing dataset [11].SVM is a linear model used for regression and classification problems. It can handle both the linear problems as well as nonlinear problems [12].

The basic concept behind the SVM algorithm is to create a hyper-plane that would be able to separate the data in the form of classes in the best way possible. The input for the SVM algorithm is the dataset, and the output so received is the line that separates the given dataset.

Linear Discriminant Analysis

Linear Discriminant Analysis (LDA) is a technique that reduces the dimensionality. This means that it reduces the number of variables (or dimensions) in a dataset while retaining most of the information. It is a statistical tool, which is utilized for classification of the binary and multiple classes. It is mainly used for supervised classification [13].

Linear Discriminant Analysis is a classification model which uses a linear decision boundary created by the rule of Baye's and data fitting [14].

Random Forest

Random forest algorithm is an ensemble learning technique used for regression and classification of the data. This approach works by generating multiple decision trees over the training time and produces the mean estimate for regression or class of individual tree [15].

In an ensemble learning technique, one problem is solved by using several different models. This learning paradigm uses multitude of models to acquire greater predictive performance that could be acquired from any individual constituent models [16].

SGD Classifier (Stochastic Gradient Descent)

Stochastic Gradient Descent is an algorithm used for optimization. It is one of the powerful tool as a classifier. It is being a part of "Supervised Learning Technique", where labeled items are classified into two or more classes (multiclass classification).

This method implements on regularized linear models with stochastic gradient descent (SGD) learning. The gradient for the loss can be calculated by each sample at a time, and the model is updated along with the learning rate. For best outcomes, the default learning rate schedule, the data should have zero mean and unit variance is to be used.

RESULTS AND DISCUSSION

Python is open-source platform that implements a large range of mining techniques and is widely used in issues of data mining. File has been created with the above-collected data. Classification models use data set to predict the accuracy of the proposed forecasting model and analyze the method and results. The SVM, LDA, Random Forest approach, SGD and decision tree classifier. The five- fold cross validation is selected for the Test Choices.

Table 1: Prediction Accuracy Percentage

Algorithm	**Fold 1**	**Fold 2**	**Fold 3**	**Fold 4**	**Fold 5**
Decision Tree	81.153	80.384	88.846	79.615	81.744
SVM	80.384	80.384	85.769	79.615	81.744
LDA	81.153	81.923	89.615	80.384	80.969
Random forest	81.153	80.384	85.000	79.615	82.519
SGD	71.153	81.153	58.846	77.307	76.317

Table 1 demonstrates predictive accuracy in percentage of the classifiers for a particular combination of the training set, test data set. In Table 2, the average of the five- runs of the proposed algorithm was estimated and analyzed.

Table 2 : Average Accuracy of Five Runs

Algorithm	**Average accuracy**
Decision Tree	82.3484
SVM	81.5792
LDA	82.8088
Random forest	81.7342
SGD	72.9552

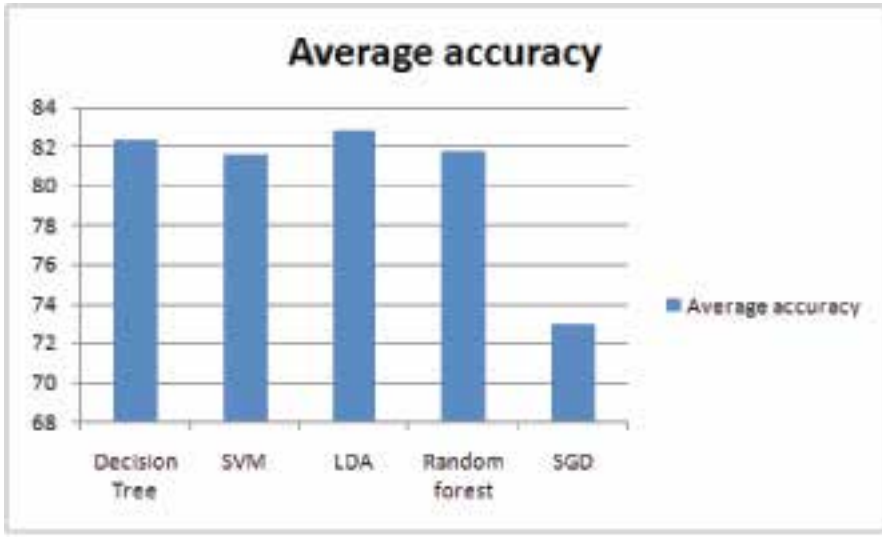

Figure 2: Comparison of Average Accuracy

Figure 2 shows the Prediction accuracy of the different methods for data mining. The findings demonstrate that LDA delivers the best of 82.80% accurate prediction preceded by Decision Tree having 82.34% accuracy. Random Forest classification shows an accuracy of approximately 81.73 percent and other classifiers indicate an accuracy of 81.57 percent and 76.31 percent respectively.

Average Run Time Comparison

Table 3: Average of time

No.	Algorithms	Time
1	Decision Tree	0.00
2	SVM	0.00
3	LDA	0.00
4	Random Forest	0.29
5	SGD	0.02

Based on Table 2 and Figure 2, the findings indicate that Random Forest requires higher average runtime compare to all four approaches used in this dataset as well as the minimum run time needed by LDA, SVM, and decision tree is 0.0000 seconds.

CONCLUSION

This work deals with academic success prediction of student using different classifiers. This research study lets the organization recognize the students' academic performance in advance and therefore, can emphasis on poor students to boost their academic outcomes. For the student database, all classification methods studied in the research showed predictive accuracy above 72 %. It is concluded that the performance of LDA is better than that of

various algorithms used in the analysis. The analysis was performed using a limited data set and it can be expanded to a huge amount of data. In addition, a mixture of multiple classification methods can be used to test the educational data set to help predict which will be the future work.

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SUSTAINABLE CONSTRUCTION: FROM PRE-ENGINEERED TO PREFABRICATED PREFINISHED VOLUMETRIC CONSTRUCTION (PPVC)

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ABSTRACT

There are quite a few different methods of construction being used all over the world for speedy, safe & economical construction. Lot of research is taking place in the construction industry and new concepts of construction have evolved in various places. The requirement by the authorities, the end users and the industry is to have speedy construction, with affordable cost, long useful life of the structures, keeping in mind the environment, safety & health of the manpower engaged in construction & the community. The structures to be built should have a design, which caters to the requirements of safety on account of weather, wind velocity, seismic factors and should be pleasing to look at and be functional. The materials to be used should be robust, and if possible, could be recyclable. This paper describes the trend in construction in the not too distant past and the merits & demerits of using one over the other. One of the latest methods being used in a few countries is the PPVC method. This method is still to be tried in India.

Keywords: Pre-engineered Building, Prefabricated Prefinished Volumetric Construction

INTRODUCTION

ABBREVIATIONS : Cross Laminated Timber (CLT), Delhi Metro Rail Corporation (DMRC), Jurong Town Council (JTC), Land Transport Authority, Ministry of Manpower (MOM), Ministry of National Development (MND), National Environment Agency (NEA), Pre-engineered Building (PEB), Prefabricated Prefinished Volumetric Construction (PPVC), Prefabricated Bath Room Units (PBUSHousing Development Board (HDB),

Permanent Modular School Buildings Program (PMSB), Public Utilities Board (PUB), Singapore Civil Defence Force (SCDF), Victorian School Building Authority (VSBA), Urban Redevelopment Authority (URA).

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PRE-ENGINEERED BUILDINGS

Pre-engineered Building (PEB) is a suitable construction technique for developing countries. It is a combination of precast & prefabricated structures. Pre-engineered buildings are generally low- rise buildings which are ideal for offices, houses, showrooms, shop fronts etc. PEB will reduce total construction time of the project by about 40%. This also allows faster occupancy and earlier realization of revenue.

In structural engineering, a pre-engineered building (PEB) is designed by a PEB supplier or PEB manufacturer, to be fabricated using best suited inventory of raw materials available from all sources and manufacturing methods that can efficiently satisfy a wide range of structural and aesthetic design requirements [1].

Benefits [2]

- Optimised design of steel reducing weight;
- Pre-engineered Building (PEB) is a suitable Construction technique for developing countries.
- Easy future expansion/modification;
- Voluminous space (up to 60M clear spans, 30 M eave heights);
- Weather proof;
- No fire hazards;
- International Quality Standards;
- Seismic & Wind pressure resistant;
- Quality design, manufacturing and erection;
- Quick delivery and Quick turn-key construction;
- Architectural versatility;
- Energy efficient roof and wall system using Rockwool & PUF insulation;
- Water-tight roofs & wall coverings;
- Pre-painted and has low maintenance requirement;
- Easy integration of all construction materials;
- Erection of the building is fast;
- The building can be dismantled and relocated easily;
- Future extensions can be easily accommodated without much hassle;
- Capable of being recycled;
- Easy on environment.

Applications [2]

Applications of pre-engineered steel buildings include (but are not limited to) the following:

- Houses & Living Shelters
- Factories
- Warehouses

- Sport Halls
- Aircraft Hangers
- Supermarkets
- Workshops
- Distribution Centres
- Commercial Showrooms
- Restaurants
- Office Buildings
- Labor Camps
- Petrol Pumps/Service Buildings
- Schools
- Community Centres
- Railway, elevated metro & bus stations
- Equipment housing/shelters
- Telecommunication shelters
- "Almost" any low-rise building

Some of the new airport terminal buildings have also been recently built with this technology.

The scientific-sounding term pre-engineered buildings came into being in the 1960s. Typically, a pre-engineered building is a metal building that consists of light gauge metal standing seam roof panels on steel purlins spanning between rigid frames with light gauge metal wall cladding [3]

In other words, it has a much greater vertical and horizontal deflection. One may think about its possibility, but it's a fact many people are not aware about Pre-Engineered Buildings. If we go for regular steel structures, time frame will be more, and also cost will be more, and both together i.e. time and cost, makes it uneconomical. Thus, in pre-engineered buildings, the total design is done in the factory, and as per the design, members are pre-fabricated and then transported to the site where they are erected in a time less than six to eight weeks. [4]

Fig.1:Janakpuri Metro Station [*Courtesy DMRC*]

Fig 2: Viaduct Installation[*Courtesy DMRC*]

Fig. 3: L&T office building – Bengaluru [*Courtesy: PEBS Pennar*]

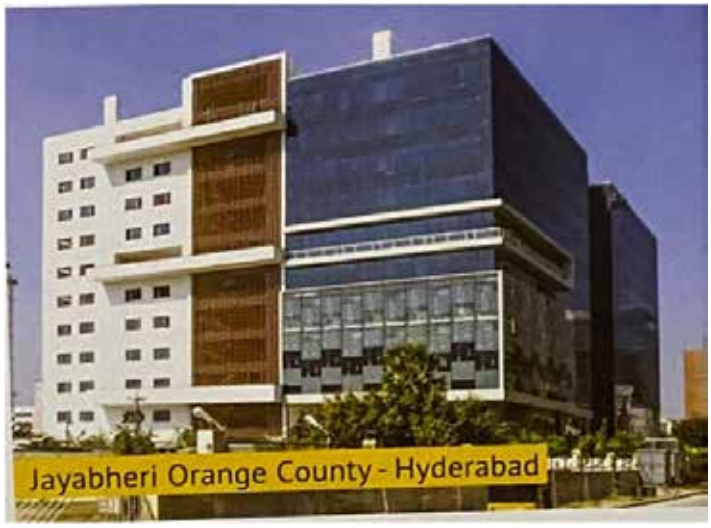

Fig. 4: Jayabheri Orange County – Hyderabad [*Courtesy: PEBS Pennar*]

Fig. 5: Office Complex [*Courtesy: PEBS Pennar*]

Fig.6: 3S Prefab BuildingTechnology
[*Courtesy: B. G. Shirke Construction Technology Pvt. Ltd.*]

Fig. 7: 3S Prefab Building Technology
[*Courtesy: B. G. Shirke Construction Technology Pvt. Ltd.*]

Disadvantages of a PEB structure [5]

Low Thermal Resistivity: Steel being a metal is good at conducting heat, thus it reduces the thermal comfort in the building. Low Fire Resistance: During fire, this type of building becomes more susceptible to damage due its conductivity.

PREFABRICATED PREFINISHED VOLUMETRIC CONSTRUCTION (PPVC)

"Prefabricated Prefinished Volumetric Construction (PPVC)" means a construction method whereby free-standing 3-dimensional volumetric modules (complete with internal finishes for walls, fixtures, fittings, floors and ceilings) are constructed and assembled, or manufactured and assembled in an accredited off-site fabrication facility, in accordance with any accredited fabrication method, transported and then installed in a building under building works [6].

This game-changing method "industrialises" construction, transforming conventional on-site building activities into factory like manufacturing and production processes.

Productivity Improvement [6]

- Fabrication of PPVC can proceed in parallel in the factory while other work site activities are ongoing to streamline the construction process.
- The on-site construction activities can be significantly reduced through the use of PPVC.
- It can potentially achieve a productivity improvement of more than between 35% to 50%, or say about 40% in terms of manpower on site and more than 20%-time savings, depending on the complexity of the projects

Better Construction Environment [6]

- As more activities are done off-site, a reduction of environment pollution can be ensured as dust and noise pollution are potentially minimised.
- Disturbance to the surrounding neighborhoods during construction can be diminished.
- Prefabrication of the building modules also leads to cleaner worksites by generating less overall construction waste on-site.

Reduction of On-Site Manpower [6]

- This will enhance worksite safety and direct the manpower to better working conditions. More construction off-site leads to less time on- site and fewer individual man-hours working at height.
- By reducing construction and installation activities and manpower from the site, and placing them off-site in a controlled factory environment, fewer workers will be on site which in turn leads to fewer accidents and less downtime.

Better Quality Control [6]

- PPVC delivers the majority of the final product from the controlled factory environment leading to increased reliability with higher- quality finishing.

- Sequence of work can be planned more efficiently with better logistics coordination.

PPVC can be considered for multi-room accommodations such as:

- Residences
- Institutions
- Hotels and hostels
- Nursing homes
- Dormitories

PPVC Considerations and Key Factors : Early Involvement of Contractors [6]

- Given that each PPVC Fabricator has his own proprietary system for the manufacture of PPVC modules, it is highly encouraging to engage the PPVC Fabricator as well as the Main Contractor early upfront during the design stage to allow their inputs into the design for a better and more effective technical solution.
- The Design and Build (D&B) and Design Development and Build (DDB) procurement models can be adopted for PPVC projects as they allow greater inputs into the design upfront by the Main Contractor and their PPVC Fabricators. This will vastly increase the build- ability and constructability of the PPVC design, leading to greater productivity in construction.

To raise construction productivity and fundamentally change the design and construction processes, the construction industry should be encouraged to embrace the concept of Design for Manufacturing and Assembly (DfMA), where construction is designed such that as much work may be done off-site in a controlled manufacturing environment [3].

PPVC is one of the game-changing technologies that support the DfMA concept to significantly speed up construction.

PPVC Modules:

- **REINFORCED CONCRETE PPVC MODULE**

Wall: Concrete, Floor: Concrete.

- **STEEL PPVC MODULE**

Wall: Steel frame with lightweight walls

Floor: Concrete or Lightweight Flooring System.

In Prefabricated Pre-Finished Volumetric Construction (PPVC), complete flats or modules made of multiple units complete with internal finishes, fixtures and fittings are manufactured in factories, and are then transported to site for installation in a Lego-like manner. PPVC can be considered for residential and mixed (residential and commercial) developments, institutional and other projects as well as other accommodation type of developments such as hotels, hostels and nursing homes [7, 8].

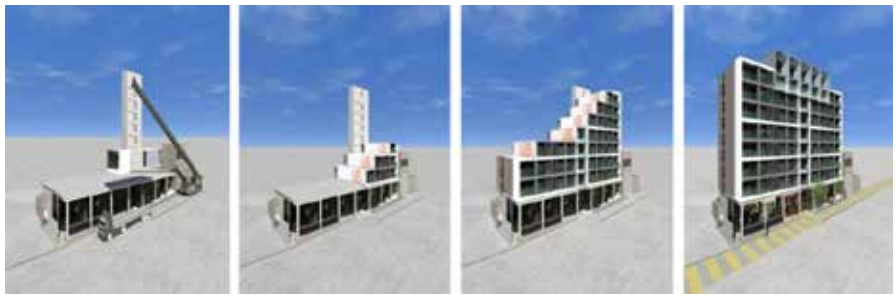

Fig. 8: Assembly of PPVC modules on site [7, 8]

Key benefits of PPVC [6]

- PPVC can help to significantly speed up construction. It can potentially achieve a productivity improvement of 35-50% in terms of manpower and time savings, depending on the complexity of the projects.
- Furthermore, dust and noise pollution can be minimised as more activities are done off-site.
- With the bulk of the installation activities and manpower moved off-site to a factory-controlled environment, site safety will also improve.

Constraints, Challenges and Future Research [9]

Project planning is one of the biggest challenges in prefabricated building construction, as several factors must be considered, such as incorporating different components within a module when they are lifted, transformation, placed on the foundation, and assembled the building. This requires clear scope, more experienced design and planning engineers, and skilled manufacturing, and it also consumes more time and money. However, the accomplishment time of modular houses or high-rise buildings was still less than that of conventional buildings I.Ramaji and A. Memari have highlighted that when the number of stories increases in a prefabricated modular building, the time savings decrease considerably. This is because of system becomes more complex, causing more challenges in project planning. Other constrains in the prefabricated system are the module dimensions, the inability to make changes onsite, and transportation, which are the most important factors needing to be considered before and after designing the structure.

Volumetric prefabricated building construction is growing in most developed countries; for example, in Sweden the market share of prefabricated building systems in the housing industry was more than 80%.However, in Australia, only, approximately3–4% of new building constructions are prefabricated buildings in a year. A major hindrance to the growth of prefab construction in Australia is that systems are developed under commercial and confidential conditions.

In Australia, the prefabricated building system (i.e. pre-cut, panellised, modular, and mobile home building system) has been recognized as one of the alternative solutions to changing the speed of conventional construction methods at a fast rate. This prefabricated

construction system also has been promoted as one of the eight key "visions" to improving the efficiency and performance of the Australian construction industry vision 2020.This form of prefabricated buildings also provides environmental benefits, such as the reduction of construction waste and CO_2 emissions, and less disturbance to the building site's neighbours by minimizing on-site noise and dust. These advantages are the driving force within the European building industry for the growth of prefabricated building systems. Furthermore, due to population growth, other countries (i.e. US, Canada, Japan, etc.) also use modular construction technology to build houses, apartments, offices, etc...

However, due to recent work by academia, industry and institutions such as prefab AUS in creating awareness of such benefits, the prefab industry is increasing its numbers, especially in the education and public services sectors. The Permanent Modular School Buildings Program (PMSB), an initiative of the Victorian School Building Authority (VSBA) of Australia, has commenced the replacement of old school buildings with newly-built modular classroom buildings targeting hundreds of schools around Victoria, Australia where already 30 modular school buildings have been completed and handed over. Figure 9 shows some of the exterior and interior images of those newly-built facilities provided by the PMSB program.

Fig. 9: Interior images of newly-built facilities provided by the PMSB program [9]

Fig. 10: New modular schools built by the PMSB program of VSBA in 2018 – Mt Waverly Heights Primary School, Glengala Primary School, Yallourn North Primary School and Beaumaris North Primary School respectively (Victorian School Building Authority [VSBA], State of Victoria, Department of Education and Training, 2018) [9]

Similarly, many public spaces in Australia such as new railway stations, police stations, healthcare facilities (Figure 1) and community centers are now being built using volumetric

modular construction and other prefabricated methods with the assistance of the Australian government. Therefore, it is quite evident from the recent advancements of the prefab industry in Australia how the collaboration of industry, academia and government authorities can heavily/ substantially impact the growth of an industry for the ultimate benefit of society. However, limited awareness on the performance, benefits, skills and knowledge required for prefabrication design and construction practice need to be developed and strengthened to increase the number of prefabricated buildings and constructions in Australia. This paper provides an overview of past research noting the limitations in the Australian context and offers some recommendations on targeted research needed in the prefabricated building system.

Fig. 11: Healthcare facilities built using modular construction in Australia, Up- Ballarat Health Cancer Care Unit, Below - Pascoe Vale Health (Prebuilt Pty. Ltd. 2018) [9]

PROTECTION, TRANSPORTATION AND LIFTING

Transportation Plan [6]

In order to ensure the quality of the PPVC modules, it is important to set up a comprehensive Transportation Plan to analyze and mitigate issues brought about during deliveries. This is to avoid potential damage to the module in long distance travel. The Transportation Plan shall comply with the local government's traffic regulatory requirements.

At the same time, Just-In-Time (JIT) delivery concept shall be studied with the transportation issues in order to ensure the following:

- The right time of delivery;
- Manage site storage;
- Optimise crane usage;
- Minimise the hoist and handling of PPVC.

Logistics for modules transportation from factory to site will determine the maximum size and volume of each module design, which in turn affects the number of modules to complete the layout design.

The size of a single module should be limited to the dimensions allowed to be transported on public roads without requiring special measures such as police escort. Height consideration has to be factored in if the route involves passing through overhead bridges.

Caution

Nonetheless, to make PPVC highrise building, its robustness and structural integrity under accidental loads such as gas explosion and vehicle collision are very essential due to its relatively novel structural form and numerous connections between the modules.

Packaging, Protection and Labelling [6]

- Packaging of the finished PPVC product shall be controlled and inspected to ensure conformance with the specified and/or contracted requirements.
- The condition of the roads surrounding the project must be able to accommodate the weight and size of the PPVC module delivery.
- The access to and within the site must be able to accommodate trailers with heavy cargo. Slopes and undulating terrain might prove to be a challenge for heavy vehicles. The turning radius of the trailers has to be considered during the planning stage of the site to avoid choking of vehicle access.
- Trailers with heavy cargo pose potential hazards upon entering while navigating the site. Traffic controller has to be employed to ensure smooth traffic management within the site.

TYPES OF CRANES [6]

The crane employed must be able to handle the weight of the PPVC modules, but at the same time be able to provide enough coverage for the intended block.

Safety[6]

A comprehensive risk assessment shall be established to identify all potential hazards. Appropriate control measures must then be set up, communicated and implemented before the commencement of works

Installation [6]

- **Access and Egress**
    - An access has to be provided for workers to move in and out during an installation. A clearly demarcated egress has to be provided as well to allow workers to exit the work area in the case of an emergency.
- **Vertical and Horizontal Alignments**
    - Special attention has to be given to the alignments during installation. The method statement for installation should indicate clearly how proper alignments can be achieved to prevent any abortive works.
    - Improper vertical and horizontal alignments cause external gaps which require additional touch-up work such as hacking and plastering. Windows and/or any external fixtures will look slanted as well.
    - MEP services including lightning protection system, sanitary and rain water discharge system etc. require proper vertical continuity connection. Installation works shall be done via the space allocated for installation works.

- **Sequencing of the Modules Installation**
  - It will be useful to work out the installation sequence of components to best maximise productivity during installation.
- **Safety**
  - Workers are prone to high-risk activities such as Lifting Operation and fall from Height. Proper safety equipment are to be provided to ensure the well -being of the workers.
  - Safety documents such as Risk Assessment and Safe Work Procedure are to be submitted and vetted thoroughly by the site safety officer. Safety Instruments are to be checked regularly. Daily Permit to work has to be submitted dutifully to ensure workers work in a safe environment.
- **Homeowner User Manual**
  - Besides engaging a trained renovation contractor, homeowners should have a ready reference of the PPVC system used in the unit. It is good practice for developers/ builders to provide a homeowner user manual of the PPVC upon completion of the project. The homeowner and subsequent buyers of the unit should obtain a copy of the homeowner user manual after taking over the unit and follow the recommendations on maintenance and renovation to PPVC units provided in the manual.

PREVIOUS RESEARCH STUDIES ON THE BENEFITS

Cost and Time [9]

Features such as when modules are lifted, transported to the final project site, placed on the foundation, and joined to form the building need to be taken into account in the design phase. This will increase the cost and duration of the design phase, but they reduce the cost and time of the on-site construction phase significantly in prefabricated construction compared to conventional construction. Furthermore, the construction activities in conventional construction are significantly affected by any climate change or weather condition interruptions. Meanwhile, in the prefabricated construction method, these kinds of interruptions were negligible, as the majority, i.e. about 80–90%, of construction activities happen in a factory. This also reduces the construction time and total cost of projects using the prefabricated construction method when compared to conventional construction methods.

In prefabricated construction, the manufacturer can order material in bulk and fabricate several modules at same time. This provides lower prices from suppliers and reduces the number of workers and transportations. This will result in savings in cost and time of the project.

Other Benefits [9]

- Reduction in safety issues like working at heights, congestion, severe weather, work place accidents, neighbouring constructions, as about 80% of the work is done in the factory yard.

- The construction in the factories provides consistent products, as they are repetitive processes and are typically undertaken with automation.
- Various studies carried out on the modular construction have found that there is improvement in environmental sustainability because of the following factors:
- There is less construction waste, where waste materials can be controlled/ reused/ recycled. The prefabricated materials can be disassembled, relocated, or retrofitted & renovated to be used in other projects, which reduces disposal waste.
- There is reduction in noise.
- The modular construction reduces landfill.
- CO2 emissions also get reduced.

STRUCTURAL PERFORMANCE OF PREFABRICATED BUILDING SYSTEMS

PPVC is a very recent development. Not too many countries are, at present, using this technology but the day is not far when this technology shall have to be adopted to achieve faster construction. There are a very few projects currently being done in Europe, the UK, USA, Canada & Australia by using PPVC. Singapore is one of the pioneers. In New York, the PPVC has very recently started by using this technology on a couple of 32 storeyed buildings.

Since the modular construction is a recent development, the structural performance of such structures is little, because of little detail of engineering research & a few case studies. The structural design approach should ensure the stability of the building structure under the natural and man- made loads, transferring such loadsto the foundation through their structural elements, non-structural elements and inter-component connections

FIRE RRESISTANCE AND AACOUSTIC PERFORMANCE [9]

Fire safety is a major concern after the building collapse at the World Trade Centre (in 2001, New York) and the Grenfell Tower (in 2017, London). These failures have led to more research and fire safety testing on structural and non-structural elements as well as their connections. The collapses of these buildings have also led to changes in building standards and to the banning of some building materials such as combustible claddings. Therefore, the fire resistance of buildings and their elements is important.

PERFORMANCE OF THE STRUCTURE UNDER EARTHQUAKE AND WINDLOAD [9]

The finished panels or modules of a prefabricated system are transported to the site and erected both horizontally and vertically using horizontal and vertical connections. Lateral bracings or core walls are used to achieve the lateral stability of the structure. C. D. Annan designed and modelled typical braced frames of Modular Steel Buildings to evaluate their inelastic behaviour under seismic loads. The results showed that the reserve strength of Modular Steel Building braced systems was greater than that of traditional braced systems (i.e. specified in the Canadian code). This study recommended that the unique detailing (i.e. frame type, special vertical connections at column) requirements of Modular Steel Building braced systems should be taken into account during the design phase to improve seismic response.

Windstorms is the one of major natural hazards in Australia as well as other countries such as US, Canada, UK, India, etc. Many studies on structural responses to wind loading for conventional building structures have been published. Limited research and few case studies are available on prefabricated building system responses. In prefabricated building, lateral wind loads are resisted and transferred by bracing elements and/or sheathing the walls, and then conveyed to the foundation.

It is essential to conduct full -scale simulated wind load tests on sample modular buildings not only for static wind loads but also for cyclonic wind loads so as to evaluate the transmission of load sharing across the various elements such as the walls, ceiling, roof, connections etc.

PPVC IN SINGAPORE

The Government of Republic of Singapore has issued instructions that in future this technology should be used for construction. Accordingly, the BCA has very recently embarked upon the PPVC mode of construction & a few projects are under execution in Singapore. These include construction of hotels, student's hostels, nursing centres, residential condominiums & ware-houses etc.

ONE-STOP BUILDING INNOVATION PANEL (BIP)

Singapore has gone ahead with the construction of various projects using PPVC technology. For thisa One-stop Building Innovation Panel (BIP) has been constituted.

This is because new construction technologies or methods often take a longer time to obtain approvals by the various regulatory agencies. Such a process might deter potential innovative products or methods which help to boost construction productivity to be introduced in Singapore.

In May 2011, the inter-agency BIP was established to facilitate expedient multiple agency evaluation and approval of innovative construction products and methods that help improve construction productivity by at least 20%.Led by MND (Ministry of National Development) and BCA (Building and Construction Authority), the panel includes other agencies such as HDB (Housing Development Board), JTC (Jurong Town Council), NEA (National Environment Agency), LTA (Land Transport Authority), URA (Urban Redevelopment Authority), SCDF (Singapore Civil Defence Force), PUB (Public Utilities Board) and MOM (Ministry of Manpower) [7,8].

For applications that have been approved by the Panel, the regulatory agencies issue an in-principle acceptance (IPA) letter for the innovative product or method. For subsequent project submission involving the products or methods issued with IPA, the submission will be accorded fast-track status. Through the BIP, new productive technologies such as PPVC and CLT can now be used in Singapore.

PREFABRICATED BATHROOM UNIT (PBU) [7,8]

The construction of conventional bathrooms requires numerous workers to do more than 13 trades on site. These include waterproofing and tiling as well as sanitary, plumbing and electrical works. On the other hand, Prefabricated Bathroom Units (PBUs) are pre-assembled

in factories before they are delivered to site for installation. This enables the construction of the entire bathroom to be streamlined and done efficiently in the controlled environment of the factory, minimising the disturbance to surrounding residents as well as ensuring higher quality finishing.

PBUs can bring about manpower and time savings of about 60%, depending on the design and materials used. This is not a new technology and has been used in Singapore in the last ten years or more.PBU designs have also evolved and improved tremendously both in Singapore and overseas as innovative materials and more advanced technologies create possibilities for PBUs to be of better quality and yet not compromised by challenges in handling and transportation. One example is the evolvement of volumetric concrete PBU to lightweight concrete PBU.

Fig. 12: PBU In Factory [7,8]

Fig. 13: Lifting PBU in Place [7,8]

Fig. 14: Finished PBU [7,8]

Ensuring PBUS meet Minimum Standards [7,8]

As BCA is mandating the use of PBUs(Prefabricated bath room units) for non-landed residential GLS (Government Land Sales) sites, it will be critical to ensure that the different PBU systems coming into the market are reliable and durable systems which will not result in future maintenance problems for the home owners

PBU suppliers are required to apply and go through the Building Innovation Panel (BIP), which consists of both BCA as well as other relevant authorities/agencies. Firstly, a PBU Screening Panel chaired by BCA and other industry representatives will look into the PBU system's design and materials used. The main objective of the panel is to ensure that each PBU system is both flexible and robust enough in terms of their design, to cater to both developers and home owners' needs. In addition, the materials used should be both safe and durable as well.Next, the other agencies on the BIP would also look into areas under their jurisdiction, e.g. SCDF will be focusing on fire safety-related issues.

SOME PPVC PROJECTS IN SINGAPORE:–

Nanyang Technological University (NTU) Project [10]

Photographs Courtesy of Office of Development & Facilities Management, Nanyang Technological University for Nanyang Crescent & SAA Architects Pte Ltd.

Fig. 15: Nanyang Crescent Hostel [10]

WOODLANDS NURSING HOME [10]

Fig. 16: Woodlands Nursing Home [10]

Fig. 17: NTU North Hill Hostel [11]

Fig. 18: Crowne Plaza Hotel Extension [12]

Fig. 19: Brownstone Executive Condominium [12]

Fig. 20: Wisteria at Yishun Avenue 4 [6]

Fig. 21: Clement Canopy Condominium [6]

Fig.22: Lifting of Unit [13]

Fig. 23: Soho Apartment, Darwin, Australia [9]

Fig. 24: Boutique Hotelbuilt in 6 days in Australia[14]

Fig. 25: Hotel Holiday Inn Express,Trafford City, Manchester, UK [14]

CONCLUSION:

There is lot of research going in all over the world to find ways & means to provide good engineering solutions for the gap between demand & supply of usable constructed space. As is evident from the material provided in this paper, the two solutions are the pre-engineered construction and PPVC. PPVC is finding slowly & steadily a niche in the available methods of construction. It may be a brilliant idea to learn from the good work done by some of the countries in successfully constructing in a fast mode different types of sustainable, environment friendly buildings with acceptable quality & safety standards.

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ASSESSMENT OF TISSUE DAMAGE TO SURROUNDINGS AFTER IMPLANTATION OF LIQUID EMBOLIC SYSTEM

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ABSTRACT

Biomaterials need to satisfy a number of prerequisites before that can be used in applications, including biocompatibility. To verify this feature, its components should be subjected to different tests, performed as recommended by various organizations and federations. These tests consist of a sequence of research protocols, described and regulated in many countries, for correct use of experimental materials under evaluation, thereby determining their safety for clinical application in humans. Embolic System often comes in contact with various tissues during the process of its implementation. In the process of assessment of damage to tissue, this study was conducted and the liquid embolic system was implanted to muscle tissue. After seven days the implants were studied by performing histopathology of the surrounding tissues. The procedure followed in the study was as per 'ISO 10993-Part 6 (2009) [17]. Test for Local Effects after Implantation and ISO 10993-Part 12 (2012) [18] for Sample preparation and Reference materials' for non-clinical laboratory studies. The liquid embolic system did not reveal any significant change with regard to the following parameters: fibrosis, neovascularisation, fatty infiltration. The macroscopic evaluation of Hematoma, oedema and encapsulation was also done. The results of the study indicated that the liquid embolic system comprise of polymer dissolved in solvent and suspended radio-opaque agent did not show any gross abnormality or microscopically cellular reaction at the implant site as compared to the control. In view of these results, the liquid embolic system may have applications to greater extent. Hence it can be concluded that this liquid embolic agent is non-toxic and biocompatible to muscle tissues.

Keywords: Embolizzation, embolotherapy, fibrinogen, fibronectin, New Zealand white rabbits, paravertebral muscle.

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INTRODUCTION

Medical devices are used for a variety of functions in humans. The biocompatibility studies elaborate the types of tests used to evaluate the interactions between man-made medical devices and host tissues and organs. The outcome of the implant response depends on the site of implantation, the species of the host, the genetic makeup of the host, the sterility of the implant, and the effect the device has on biological processes. Biological processes involved in host tissue responses to implantable medical devices reflect activation of a series of cascades that require blood proteins or other components found in the blood [2,5,10,12].

Embolization is defined as the therapeutic introduction of various substances into the circulation to occlude vessels, either to arrest or prevent hemorrhaging; to devitalize a structure, tumor, or organ by occluding its blood supply; or to reduce blood flow to an arteriovenous malformation.

Venous malformations are the most common vascular malformation and are generally found in the head and neck area or in the extremities. Accurate diagnosis is necessary to establish cause and determine treatment [1]. The International Society for the Study of Vascular Anomalies has divided vascular malformations into simple and combined types. The simple types include capillary venous, and lymphatic malformations. Combined types include arteriovenous malformation and artertiovenous fistula. Doppler ultrasound can identify low flow of venous malformations, and MRI can identify lesion margins and invasion into other structures.

Embolization is performed by radiologists who have completed advanced post-residency training (Fellowhip) in interventional radiology.

Therapeutic goals

Embolizzation has mainly three therapeutic goals:

a. An adjunctive goal (For example, pre-operative, adjunct to chemotherapy or radiation therapy)

b. A curative goal (For example, definitive treatment such as that performed in cases of aneurysms, arteriovenous fistulae [AVFs], arteriovenous malformations [AVMs] and traumatic bleeding).

c. A palliative goal (For example, relieving symptoms, such as those of a large AVM, which cannot be cured by using embolotherapy alone)

Groups of Medical conditions

Medical conditions treated by using embolotherapy can be grouped as follows:

a. Vascular anomalies (For example, AVM, AVF, venous malformation [VM], lymohatic malformation [LM], and hemangioma) [3,4,5]

b. Hemorrhage (For example, psedoaneurysms and GI tract, pelvic, post-traumatic, epistaxix, and hemoptysis bleeding)

c. Other conditions (For example, tumors varicoceles and organ ablation)

Embolic Agents and Possible Harmful Impacts

Materials used in embolization include coils, ethanol, sodium tetradecyl sulfate-cyanoacrylate, polyvinyl alcohol (PVA), microspheres and gelatin sponge (Gelfoam) among others. When absolute alcohol is mixed with a contrast medium and when small catheters are used, superselective vascular embolization can be safely performed under fluoroscopic guidance. Ethiodized oil(Ehtiodol), an oily contrast medium is most commonly used [3,4,5,6,7].

Ethanol is the most commonly used liquid agent. Embolization with absolute alcohol has a direct possible toxic effect on the endothelium that activates the coagulation system and causes the micro-aggregation of red blood cells. It can be damaging if it reaches the capillary bed of any given tissues (e.g. skin), and it usually causes significant soft tissue swelling, which may subsequently cause compartment syndrome (nerve compression).

If large amounts of absolute alcohol enter the systemic circulation, toxic effects can occur which can induce CNS depression, hemolysis and cardiac arrest.

Cyanoacrylate, or N-butyl-2 cyanoacrylate (NABCA) is a rapidly hardening liquid adhesive often referred to as glue. This substance hardens (polymerizes) immediately on contact with blood or other ionic fluid. Polymerization results in an exothermic reaction that can destroys the vessel wall[8].

Penetration of the capillary bed may cause severe tissue injury. Because of the rapid polymerization, coaxial catheterization, precise positioning of the delivery catheter and considerable skill is required for NBCA embolization.

Polyvinyl alcohol obtained by reticulation of PVA with formaldehyde, is available with large range of sizes and successful PVA particle embolization depends on the formation of a thrombus in which a large proportion of the embolized vessels are filled with thrombus.

Tris- acryl gelatin microspheres, another embolic agent, possible non-reabsorbable, and precisely calibrated particles, produced from acrylic polymer and impregnated with porcine gelatin, size alteration can cause canalization.

These are few of the common example of embolic agents which show how there are possibility of tissue damage if comes in contact.

An inherent problem associated with implant is their propensity to be coated by host proteins such as fibronectin and fibrinogen. Fibrinogen/Fibrin seems to be a dominant coating host protein, while fibronectin is used in long term applications. They are also responsible for reduced blood flow and locally compromised immunity by impaired natural killer, lymphocytic and phagocytic blood cells. Naturally derived materials differ from the synthetic biomaterial as they pass an inherently bioactive legend landscape. The host response to naturally derived materials is potentially more complex than the synthetic materials. Biomaterial induced tissue damage leads to focal hemorrhage and oedema formation. Leakage of proteins alters the composition of interstitial fluid, which becomes enriched with plasma protein and lead to the formation of fibrous capsules [13, 14,15,16].

The explorations in medical sciences have provided numerous biomaterials that can perform, augment or replace the natural function of a defective organ by interacting with the biological system. These materials represent a unique class of biomedical functional materials that potentially perform broad spectrum of biological activities in the absence of original living tissue/organ thereby replacing the problems encountered with the defective tissue/organ and support smooth functioning of the organism. So, it is necessary that designed biomaterials should serve its purpose in the environment of the living body without affecting other bodily organs. Therefore a biomaterial should be non-toxic [20,22].

It is of significant importance to assess the surrounded tissue damage after implantation meant for exposure for seven days.

MATERIAL AND METHOD

Liquid Embolic System: Sample of liquid embolic system was supplied by Meril Life Science Pvt Ltd. It is a polymer radio-opaque agent suspended in solvent.

Source of Animals: Young adult New Zealand White rabbits weighing about 2-3 kg were provided by Shriram Institute for Industrial Research, Delhi (SRI).

The test article and control both were handled aseptically throughout the test procedure.0.9% physiological saline USP was used as control in this injection test as the test article is also available in the liquid form. In order to check the effects produced by the same, comparable control are required which should be non- irritable and 0.9% physiological saline. USP fits in that criterion. Eighteen hours before the test, hair from the back of all three rabbits were closely clipped with clipper on both sides of the spinal column ensuring no pain, injury and discomfort to all the animals.

Three healthy male rabbits were clipped eighteen hours before the injection, in such a way that they were free from fur from the back and both sides of the spinal column to yield a sufficient injection area. The test and control specimens were injected under aseptic conditions. Normal saline 1ml was taken as control. The test specimen 1ml was shaken vigorously for 30 minutes and then injected on four locations of the left side in the paravertebral muscle of all the three rabbits.

Similarly, four control specimens comprising of normal saline 1ml were injected intramuscularly at four locations of right side of the same rabbit.

The animals were kept under environmental conditions as per the ISO 10993-Part 2 and observed once daily for one week.

After one week all the three animals were sacrificed to recover solidified test article implants and surrounding muscular tissue for histo-pathological examination. Each excised implant site was examined using magnifying lens and auxiliary light source for any gross pathological findings. The excised sites containing test injects were preserved in buffered formalin. Sections of excised injection sites (5-6 μm thick) were cut after thorough processing of tissue. The injectables remained in place in hardened form during processing up to possible extent to ensure correct orientation of the surrounding tissue. The sections were stained with Haematoxylin and Eosin stain, examined and scored microscopically.

Table 1: Histological Evaluation system

Parameter	Grade	Description
Fibrosis	0	None
	1	Narrow band
	2	Thick band
	3	Extensive band
	4	Thickness (μm)
Neovascularization	0	None
	1	Minimal capillary proliferation, focal 1-3 buds
	2	Group of 4+7 capillzries with supporting fibroblastic structures
	3	Broadband of capillaries with supporting structures
	4	Extensive band of capillaries with supporting fibroblastic structures
Fatty Infiltration	0	None
	1	Minimal amount of fat associated with fibrosis
	2	Several layers of fat and fibrosis
	3	Elongated and broad accumulation of fat cells around the implant site
	4	Extensive fat completely surrounding the implant

RESULTS

Table 2: Macroscopic Evaluation On Seventh Day

Animal No.	Cellular Reaction/Response	Left Flank			Right Flank		
		Test Site			Control Site		
		1	2	3	1	2	3
1.	Hematoloma	0	0	0	0	0	0
	Oedema	0	0	0	0	0	0
	Encapsulation	0	0	0	0	0	0

Table 3: Macroscopic Evaluation On Seventh Day

Animal No.	Cellular Reaction/Response	Left Flank			Right Flank		
		Test Site			Control Site		
		1	2	3	1	2	3
2.	Hematoloma	0	0	0	0	0	0
	Oedema	0	0	0	0	0	0
	Encapsulation	0	0	0	0	0	0

Table 4: Macroscopic Evaluation On Seventh Day

Animal No.	Cellular Reaction/Response	Left Flank			Right Flank		
		Test Site			Control Site		
		1	2	3	1	2	3
3.	Hematoloma	0	0	0	0	0	0
	Oedema	0	0	0	0	0	0
	Encapsulation	0	0	0	0	0	0

Table 5: Microscopic Evaluation On Seventh Day

Animal No.	Cellular Reaction/Response	Left Flank			Right Flank		
		Test Site			Control Site		
		1	2	3	1	2	3
1.	Fatty Infilteration	0	0	0	0	0	0
	Necrosis or Fibrotic changes	0	0	0	0	0	0
	Neovascularisation	0	0	0	0	0	0

Table 6: Microscopic Evaluation On Seventh Day

Animal No.	Cellular Reaction/Response	Left Flank			Right Flank		
		Test Site			Control Site		
		1	2	3	1	2	3
2.	Fatty Infilteration	0	0	0	0	0	0
	Necrosis or Fibrotic changes	0	0	0	0	0	0
	Neovascularisation	0	0	0	0	0	0

Table 7: Microscopic Evaluation On Seventh Day

Animal No.	Cellular Reaction/Response	Left Flank			Right Flank		
		Test Site			Control Site		
		1	2	3	1	2	3
3.	Fatty Infilteration	0	0	0	0	0	0
	Necrosis or Fibrotic changes	0	0	0	0	0	0
	Neovascularisation	0	0	0	0	0	0

APPENDIX 1: MICROPHOTOGRAPHS

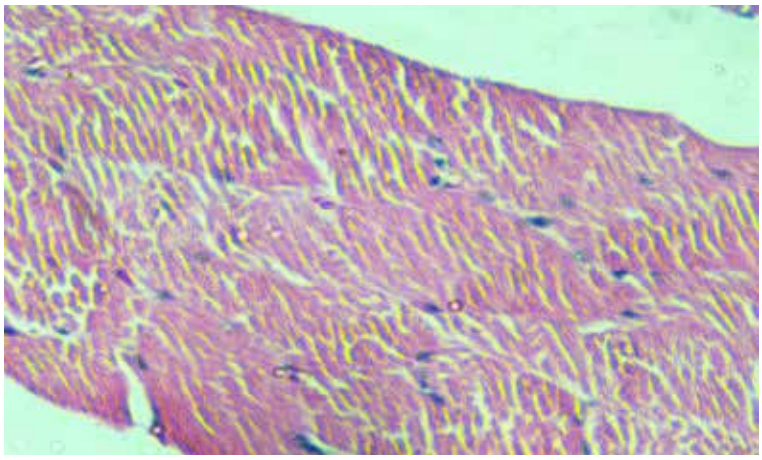

Figure 1: Microphotograph of the muscle injected with Liquid Embolic System showing no lesions

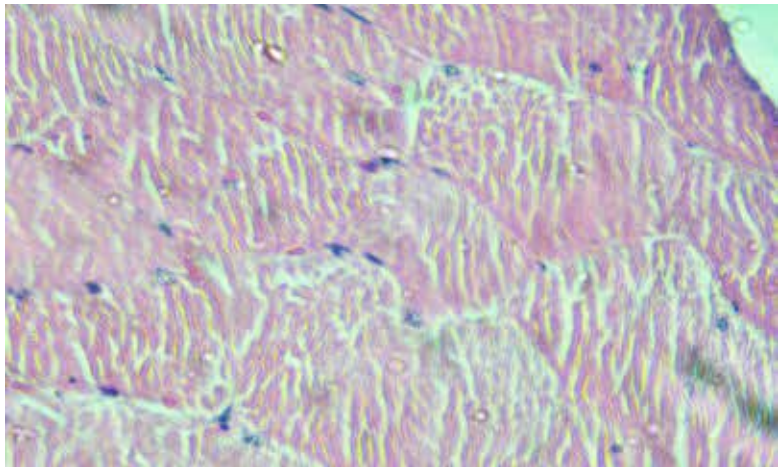

Figure 2: Microphotograph of the muscle injected with N.S.S showing no lesions

Toxic signs: No toxic signs & symptoms were noticed during observation period post-injection in any of the animal.

Mortality: No mortality was observed in any of the animal during observation period post- injection.

Macroscopic Observation: The injection sites of all the animals were observed for alteration of normal structure and regional draining lymph nodes. The test and control site of all the animals were compared and found free of hematoma, edema and encapsulation. (Table 2-4).

Microscopic evaluation : No gross pathological as well as histo-pathological changes were observed in around the implants sites (Table 5-7).The microphotograph of the slides of the muscles injected with menox and 0.9% physiological saline is shown in microphotographs Appendix 1.

CONCLUSION

To evaluate response of liquid embolic system as implant in paravertebral muscles of New Zealand white rabbit, the embolic system of 1 mL quantity was implanted in the four locations of left paravertebral muscle of all the three rabbits via intramuscular injection route. On observing the implant sites after seven days interval, no abnormal tissue changes or any overt signs of rejection such as cysts, necrosis or local inflammation at the injection sites in the muscle of rabbits were observed, when compared with its corresponding control site of the same animal. Thus, this study shows the biocompatibility of the test item with living tissue.

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