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An Assessment of Health Status of Seasonal Migrant Brick Kiln Workers of Jorhat District of Assam

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Abstract: ***The present study investigates the health status of seasonal migrant workers of brick kilns. The sample for the study comprised of 371 seasonal migrant workers in the age group of 18-70 years including both sexes. A combination of multistage and judgement random sampling technique was used for the selection of the sample group from 17 brick kilns of Jorhat district of Assam state. Clinical assessment was conducted to look for the symptoms of various ailments (anaemia, malnutrition, hypertension, respiratory rate and other pathological signs). The results of the study revealed that seasonal migrant workers of brick kilns were suffering from disturbed emotional status along with capacity for strenuous physical activity. It was found that though 62.5 percent workers had medium body built, 38.3 percent workers had underweight BMI (less than18.5 kg/m^2) indicating the highest prevalence of malnourishment among 52.3 percent workers of 18 to 30 yrs of age. Half of the workers were identified undernourished (23 to 18.5 cm), moderately undernourished (18.5 to 16 cm) and severely undernourished (<16 cm) mid upper arm circumference (MUAC). 60.9 percent workers had systolic blood pressure above 120 and 7.3 percent workers had systolic blood pressure below 100. The observations for the signs and symptoms of anaemia and malnutrition indicated that 85.7 percent of the workers had pale cold skin, 73.9 percent had general weakness and 66.6 percent had yellow conjunctiva, 73.6 percent workers were feeling dizziness during working time, 96.8 percent had pallor on the palm of the hand, 82.2 percent workers were identified fatigue symptoms, 63.3 percent respondents were examined presence of bitot's spots on the eyes. Majority (90.5%) of the respondents showed clear cut presence of anaemia. The most significant fact of this research study is that it attempts to provide evidence based recommendation for improving access and reducing barriers to health and healthcare services and raises various issues related to right to health to the vulnerable groups of brick kiln workers. The results of this study have provided comprehensive evidence to hold implications for academics, policy makers, trainers, educationalists, professionals, workers and employers to introduce health programmes in order to improve the health of seasonal migrant workers of brick kilns.***

Keywords: Anaemia, BMI, MUAC, malnutrition, pathological signs and strenuous physical activity

1. Introduction

New buildings use bricks, and construction is the symbol of improvement of urban sector. However, the reality is that people, who worked with the rough material, will never be able to own a development themselves; sometimes they don't even enough money for a meal. Most of the brick kiln workers are seasonally migrated from rural and backward places to the brick kiln site for selling their labour at cheap rates. Dominated by illiteracy, poverty, debt bonded and underdevelopment, the brick kiln workers are known for poor health and poor access to health care. The seasonal migrant workers move for a short period of time during the brick making season that are living in poor, unhygienic, unhealthy and polluted environments near the brick kilns. They are constantly at risk to various types of illness. It is very surprising that the first response on falling ill is to come back home. Thus the outcome is loss of job and earning. Work related illnesses are very common to them. Jorhat is an industrially growing district of Assam located in the heart of the state which has large number of brick kilns due to increased construction sites in and around the district. Seasonal migrant workers make enormous contributions to the industrial economy of Assam primarily of Jorhat district through the major sector of brick-making. There are a large number of migrant workers at the brick kilns in Jorhat district who are compelled to live under inhuman conditions without basic minimum facilities and entitlement.

2. Significance of the Study

The present research study investigates the health status of seasonal migrant workers of brick kilns in Jorhat district. The seasonal migrant workers are educationally backward, poor, unexposed to modern influences and being debt bounded suffered from various physical and mental health diseases due to the heavy polluted environment of brick kilns. Generally, health hazards are a serious problem for the migrant workers in this sector. This study gives an insight to the health profile of seasonal migrant brick kiln workers of Jorhat district of Assam which would help planner and policy maker to plan various health programmes. It would also help them in promoting the awareness level of seasonal migrant workers related to their health.

3. Objectives

The specific objectives of the study are:

1) Provide an overall framework about the general health of the seasonal migrant workers of brick kilns.
2) Assess height and weight to study the body mass index of the seasonal migrant workers.
3) Assess the basic anthropometric measures of physical and nutritional health.
4) Evaluate blood pressure, pulse and respiratory rate to rule out any heart ailment and general physiological problems among the sample group.

4. Research Methodology

For the purpose of analysis, primary data was collected from 45 % brick kilns chosen by multistage judgment sampling procedure from the district of Jorhat, one of the industrialized district of Assam having 60 brick kiln units unevenly distributed in 8 community development blocks under six circles. At the first stage all the six circles i. e. West Jorhat, Mariani, Teok Titabar, East Jorhat and Majuli were chosen purposively on the basis of major concentration of brick kiln industries in each circle and to make a fair representation of sample. At the second stage, seventeen (17) brick kilns were selected out of the total sixty (60) brick kilns of the district proportionately from the six circles depending upon the type of workers (only seasonal/ only local/ both local and seasonal workers), concentration of seasonal migrant workers in the brick kilns and location and accessibility of brick kiln to the nearest town. The brick kilns recruited only seasonal workers and both seasonal and local workers were selected for the research study which considered as the first criteria. The second criteria for selection of a brick kiln for research study were that the seasonal migrant workers constitute 60 percent or more than the total workforce. As such only 37 brick kilns of Jorhat fulfilled the two criteria of selection and 17 brick kilns out of those were selected for primary data collection. Thus, 4 brick kilns selected from Titabor circle, 2 brick kilns from Majuli circle, 2 brick kilns from Teok circle, 2 brick kilns from west Jorhat circle, 6 brick kilns from Mariani circle and 1 brick kiln from East Jorhat circle were selected on the basis of judgement random sample. Primary data was carefully collected from 371 seasonal migrant workers (respondents) which fairly represent age and sex of workers on the basis of judgement random sample with the help of statement questionnaires. Physical health status of workers was examined and measured by physician during their resting hours to derived information regarding morbidity pattern, diseases suffered from, physical body structure, vital signs, anthropometric measures, signs and symptoms of malnutrition and morbidity. Physical appearances of workers were also recorded during physical examination. Clinical assessment was undertaken for the signs of various ailments (anaemia, malnutrition, hypertension, respiratory rate, and other pathological signs) by the medical team.

5. Results and Discussion

The results of the present research have been presented under various sections. These sections provide an overview of health status of seasonal migrant brick kiln workers.

5.1 Profile of the Respondents

Out of total 371 seasonal migrant brick kiln workers, the highest 209 workers (56.3%) were in the age group of 31 to 60 years, The age group of 19 to 30 years was shared by 34.2% of the seasonal migrant workers. The adolescent age group of 15 to 18 years was shared by 4% of the total migrant workers. The children of the age group of below 14 years and aged population of 61 to 80 years age groups were shared by 2.7% and 2.7% seasonal migrant workers respectively. 326 numbers of seasonal migrant workers were male which constitute 87.9 % of the total seasonal workforce. On the other hand only 12.1 % seasonal migrant workers belonged to female. Majority of respondents (57.4 percent) of seasonal migrant worker were illiterate. Only 42.6 percent respondents were literate.

5.2 Health Status

Table 1: Health status of seasonal migrant workers

Sl. No.	*Observations*	*Percentage*
1	Sleep	
	Good	52.9
	Disturbed	52
	Insomnia	5.1
2	Physical Exertion	
	Excessive	76.5
	Moderate	22.9
	Mild	0.5
3	Digestion	
	Normal	51.5
	Indigestion	41
	Loss of appetite	7.5
4	Emotional status	
	Stable	39.4
	Disturbed	60.6
5	History of Illness	
	Absent	4.3
	Present	96.7
6	Bowel habits	
	Regular	53.9
	Irregular	35.8
	Constipated	10.2

Observations regarding their health status (Table - 1) shows that highest respondents (87.5%) had good sleep, 52% respondents revealed disturbed sleep while only 5.1.% had insomnia. 76.5% were in habit of excessive physical exertion, 22.9% showed moderate physical exertion and 0.5% were having mild physical exertion. The status of digestion was observed and it shows that 51.5% respondents were having normal digestion, 41% had indigestion and 7.5% were having complaint of loss of appetite. None of the subject reported addiction to any kind of drug. 39.4% subjects reported being emotionally stable while 60.6% subjects reported that they were emotionally disturbed most of the time. Majority 96.7% of the respondents reported signs of different illness in the past while only 4.3% subjects revealed no signs of illnesses during the past. The data regarding their bowel habits shows that 53.9% had regular bowel habits, 35.8% were having irregular bowel habits and 10.2% were constipated.

Table 2: Signs and symptoms of anaemia and malnutrition

Sl. No.	*Observation*	*Percentage*
1	Pale cold skin	
	Present	85.7
	Absent	14.3
2	Fatigue	
	Present	82.2
	Absent	17.8
3	General Weakness	
	Present	73.9
	Absent	26.9
4	Weight loss	
	Loss	52.6
	Same weight	47.4
5	Dizziness	

	Present Absent	73.6 26.4
6	Signs of nutritional deficiency Present Absent	 95 5

Table – 2 displays that 85.7% seasonal migrant workers had pale cold skin and 14.3% workers were examined no symbols of pale cold skin. 82.2% workers were identified fatigue symptoms while physically examined by physicians during their resting times in brick kilns. Only 17.8% respondent workers didn't have fatigue symptoms. 73.9% respondents were generally weak and 26.1% respondents were generally strong health status. 52.6% respondents informed weight lost after seasonal migration to brick kilns. Weight loss of these respondents indicated exposed risk of deteriorated health or diseases. 47.4% respondents had same weight after migrating to brick kilns. 73.6% respondents were feeling dizziness during working time and 26.4% respondents didn't feel any symptoms of dizziness after seasonal migration to brick kilns. 95% respondents were examined signs and symptoms of nutrient deficiency and malnutrition and only 5 % respondents had no signs of nutritional deficiency.

Table 3: Signs and symptoms of morbidity

Sl. No.	*Observations*	*Frequency*
1	Yellow conjunctiva Present Absent	 66.4 33.6
2	Pallor Present Absent	 96.8 3.2
3	Bilot's spots Present Absent	 63.3 36.7
4	Pitting oedema Present Absent	 41.5 58.5
5	Goiter Present Absent	 21.3 78.7

In respect to the present health study of brick kiln seasonal migrant workers (table – 3), if was found that highest of the respondents (66.6 percent) were examined yellow conjunctiva symptoms and 33.4 percent respondents had not found yellow conjunctiva symptoms. It was found that highest 96.8 percent respondents were examined pallor on the palm of the hand or the conjunctiva of the eye which indicated their nutritional deficiency, vitamin D deficiency, iron deficiency, headache, cold, illness, sleep deprivation and anaemia. Only 3.2 percent respondents had no pallor on the palm of the hand or the conjunctiva of the eye. 63.3 percent respondents were examined presence of bitot's spots on the eyes and 36.7 percent had normal eyes. Generally the polluted working condition was the main cause of developing bilot's spots on eyes. It was an indication of their poor nutritional status. 41.5 percent respondents were suffered from pitting oedema and 58.5 percent respondents were found and examined absence of such disease. During their physical examination by physicians in a health check up camp in brick fields 21.3 percent respondent workers were found the possibility of having sufferance from goitre and 78.7 percent respondents were not found the symptom of such disease.

5.3 Body Built

62.5 percent workers had medium body built, 35.6 percent workers had lean body built and 1.9 percent had heavy body built. The body built status of the respondents were not healthy as only 62.5 percent respondents had medium body built status.

5.4 Body Structure

Body structure and body built were the two most essential physical conditions required for assessment of health status. 67.7 percent seasonal migrant workers had medium body structure, 25.1 percent had short body structure and only 7.3 percent had tall body structure. The body structures of workers didn't indicate their good health as only 251 workers out of the 371 workers had medium body structure.

5.5 Body Mass Index

Table 4: Frequency and percent distribution of respondents according to body mass index categorization for adults (above 20 years)

BMI Categorization (in kg/m^2)	Frequency	Percent	Valid Percent	Cumulative Percent
very severely underweight (less than 15)	8	2.2	2.2	2.2
severely underweight (from 15.0 to 16.0)	15	4	4	6.2
underweight (from 16.0 to 18.5)	119	32.1	32.1	38.3
normal or health weight (from 18.5 to 25)	225	60.6	60.6	98.9
overweight (from 25 to 30)	2	0.5	0.5	99.5
obese class I or moderately obese (from 30 to 35)	2	0.5	0.5	100
Total	371	100	100	

Body Mass Index (BMI) is a simple index of weight-for-height that is commonly used to classify underweight, overweight and obesity in adults. It is defined as the weight in kilograms divided by the square of the height in metres (kg/m^2). The table – 4 shows that 2.2 percent respondents were very severely underweight (less than 15 kg/m^2), 4 percent respondent workers were severely underweight (15.0 to 16.0 kg/m^2), 32.1 percent were underweight (16.0 to 18.5 kg/m^2), 60.6 percent respondents were normal or health weight (18.5 to 25 kg/m^2), 0.5 percent respondents were overweight (25.0 to 30 kg/m^2) and remaining 0.5 percent respondents were obese class I or moderately obese (over 30 kg/m^2). Highest 60.6 percent respondent workers had normal or health weight and lowest 0.5 percent respondent worker had obese weight. 38.3 percent workers with BMI (kg/m^2) less than 18.5 kg/m^2 indicated risk of developing problems such as nutritional deficiency and osteoporosis. Low risk of health problems was indicated by a healthy range of BMI (18.5 to 25 kg/m^2) which was experienced by 61.6 percent workers. 0.5 percent workers had the BMI ranges between

25 to 30 kg/m^2, the workers would face health problems like moderate risk of developing heart diseases, high blood pressure, stroke and diabetes. High risk of developing heart diseases, high blood pressure, stroke, diabetes was observed among 0.5 percent workers with BMI above 30 kg/m^2. BMI is a useful measure of overweight and obesity. BMI is an estimate of body fat and a good gauge of risk for diseases that can occur with more body fat. The higher BMI, the higher your risk for certain diseases such as heart disease, high blood pressure, type 2 diabetes, gallstones, breathing problems, and certain cancers.

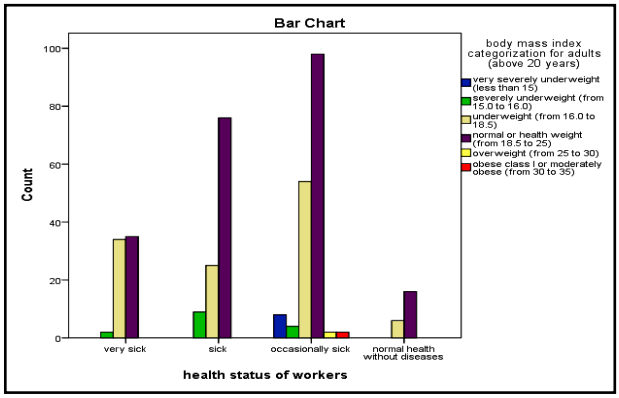

Figure 1: Bar chart showing health status of workers by BMI

From the bar chart - 1, it was found that the highest workers with normal or healthy weight body mass index were suffering from occasional sickness without any major deadly diseases. Severely underweight and underweight workers were recognized having very sick, sick and occasionally health statuses. Workers who were examined overweight had occasionally sick health status. Workers who had normal health status without any deadly disease were examined underweight and normal health weight.

5.6 Waist Circumference of female workers

Table 5: Crosstabulation shows percent distribution of female workers according to body mass index by waist circumference
% of total

		Waist circumference categorization for female (in cm)			Total
		risk (72 cm or less)	low risk (72.0 to 79.9 cm)	increased risk (80.0 to 87.9 cm)	
Body Mass Index categorization for adults (above 20 years)	severely underweight (from 15.0 to 16.0)	7.0%	4.7%		11.6%
	underweight (from 16.0 to 18.5)	32.6%	25.6%	2.3%	60.5%
	normal or health weight (from 18.5 to 25)		20.9%	7.0%	27.9%
Total		39.5%	51.2%	9.3%	100.0%

The table -5 shows that the two cases of overweight and obese BMI were missing among the workers. Assuming the total number of female respondents as hundred percent in the above table displays the association of waist circumference to BMI of the female respondents. 60.5 percent respondents were underweight out of which 7.0 percent respondents were exposing health risk due to low waist circumference (72 cm or less), 4.7 percent respondents were exposing low health risk due to normal waist circumference of 72.0 to 79.9 cm. Normal or health weight was experienced by 27.9 percent respondents out of which 20.9 percent respondents had seemed to low health risk due to normal waist circumference of 72 to 79.9cm. 11.6 percent respondents were severely underweight. Majority of these respondents (7.0 percent) were exposing to health risk due to low waist circumference and 4.7 percent respondents were seemed to low health risk originated from heavy weight, high fat distribution and high waist circumference as they had the normal waist circumference of 72 to 79.9 cm indicating normal fat distribution in their bodies. Highest of all respondents i. e. 32.6 percent respondents exposed to health risk due to low waist circumference accompanied with underweight. The lowest of all respondents were 2.3 percent respondents who were exposed to increased health risk due to high waist circumference accompanied with underweight.

Table 6: Chi-Square Tests of BMI and waist circumference among female respondents

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.950[a]	4	.012
Likelihood Ratio	17.038	4	.002
Linear-by-Linear Association	10.219	1	.001
N of Valid Cases	43		
a. 6 cells (66.7%) have expected count less than 5. The minimum expected count is .47.			

Table – 6 indicates the calculated χ^2 statistic, for 4 degrees of freedom is 12.950, and p = 0.012; i. e., a small probability of the observed data under the null hypothesis of no relationship. The waist circumferences of female respondents are related to their BMI ($p < 0.005$).

Table 7: Symmetric Measures of BMI and waist circumference of female respondents

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.493	.099	3.631	.001[c]
Ordinal by Ordinal	Spearman Correlation	.509	.101	3.783	.000[c]

In the table – 7, the symmetric measures displays the Pearson's coefficient of correlation is .493 and Spearman's Correlation value is .509. The two values of correlation indicate moderate positive correlation between respondent's BMI and Waist circumference. An increase in the respondent's BMI would certainly increase their waist circumference. The Asymp. Std. Error is low (0.099 for Pearson's R and 0.101 for Spearman's Correlation) higher than .05 levels indicating that the association between health status and quality of work was not significant.

5.7 Waist Circumference of Male Workers

Assuming the total number of male respondents as hundred percent the table – 8 displays the association of waist circumference to BMI of the male respondents. 64.9 percent male respondents had normal or health weight out of which 40.2 percent respondents were exposing health risk due to low waist circumference (72 cm or less), 23.5 percent respondents were exposing low health risk due to normal waist circumference of 72.0 to 79.9 cm and 1.2 percent respondents were exposing to health risk due to increased waist circumference.

Table 8: Cross tabulation showing body mass index categorization for male respondents (above 20 years) in relation to their waist circumference

		waist circumference categorization for male (in cm)			Total
		risk (86 cm or less)	low risk (86.0 to 93.9 cm)	increased risk (94.0 to 101.9 cm)	
Body Mass Index categorization for adults (above 20 years)	very severely underweight (less than 15)	2.4%			2.4%
	severely underweight (from 15.0 to 16.0)	2.4%	0.6%		3.0%
	underweight (from 16.0 to 18.5)	24.1%	4.3%		28.4%
	normal or health weight (from 18.5 to 25)	40.2%	23.5%	1.2%	64.9%
	overweight (from 25 to 30)	0.3%		0.3%	0.6%
	obese class I or moderately obese (from 30 to 35)			0.6%	0.6%
Total		69.5%	28.4%	2.1%	100.0%

During the physical examination it was found that 28.4 percent male respondents were underweight out of which 24.1 percent respondents were exposed to health risk due to lower waist circumference and 4.3 percent respondents had low health risk as they had normal waist circumference. 3.0 percent male respondents were severely underweight out of which 2.4 percent respondents had faced by health risk due to low waist circumference and 0.6 percent respondents were experiencing normal health risk due to normal waist circumference. 2.4 percent respondents were very severely underweight (BMI of less than 15 kg/m^2 with faced health risk due to low waist circumference. Waist circumference in combination with BMI to assess health risk showed that 0.6 percent male respondents with BMI 25 to 30 kg/m^2 were overweight out of which 0.3 percent male respondents with low waist circumference conferred no increased health risk and 0.3 percent respondents with high waist circumference conferred an increased health risk. In case of 0.6 percent male obese respondents (BMI 30 – 35 kg/m^2) with high waist circumference conferred a high health risk originated from heavy weight, high fat distribution and high waist circumference as they had the normal waist circumference of 72 to 79.9 cm indicating normal fat distribution in their bodies. Highest of all respondents i. e. 40.2 percent respondents had normal or health weight exposed to health risk due to low waist circumference. The lowest of all respondents were 0.3 percent respondents who were exposed to increased health risk due to high waist circumference accompanied with overweight.

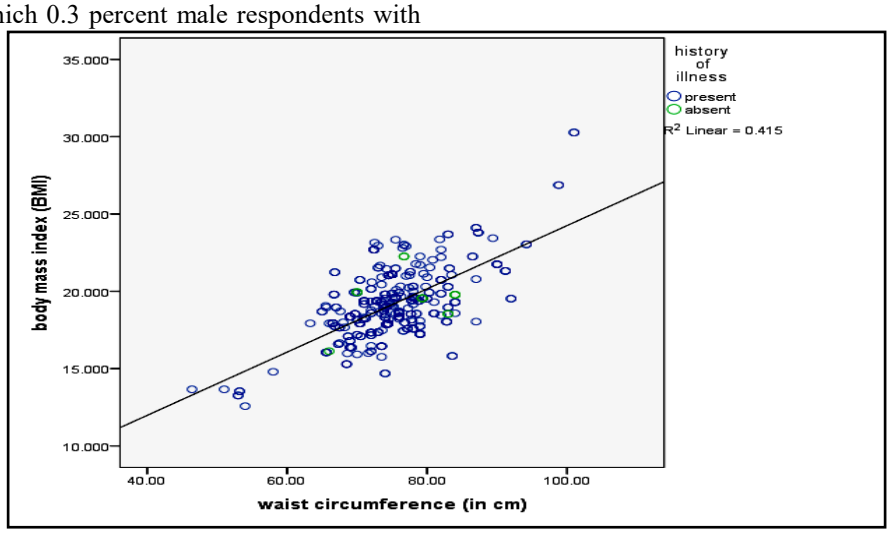

Figure 2: Scatter diagram with fit line showing association between waist circumference and BMI of male workers

The scatter plots show the BMI in respect to waist circumference by history of illness of male workers. From the above scatter plots (fig. 2), it is obvious that the workers with waist circumference between 70 to 90 cm. had normal BMI (18.5 to 25 kg/m^2). On the other hand, only six cases of absence of illness or diseases were found from the graph. That means except the six workers who had not been suffering from any serious diseases since the last five years all of the 365 male workers had been suffering from serious or major disease of any kind from the last five years. The direction of fit line indicates that there was a strong positive association between waist circumference and BMI of male workers. As the waist circumference of workers increased, their BMI was also increased and vice versa. It also displays the coefficient of determination, R^2. R^2 is the proportion of the variability in the dependent variable (BMI) shown on y axis that can be explained by the independent variable (waist circumference) shown on x axis. In case of waist circumference and BMI of workers, 41.5 % of the variability in BMI of workers can be explained by their waist circumference. The value of R^2 is 0.415 which is smaller than 1, means that the line fits 41.5 percent of the data. Closer the value of R^2 to 1, means better the line fits to the data and vice versa.

5.8 Mid Upper Arm Circumference

Table 9: Frequency and percent distribution of respondents according to mid upper arm circumference (MUAC)

Categorization of MUAC	*Frequency*	*Percent*	*Valid Percent*	*Cumulative Percent*
severely undernourished (<16cm)	8	2.2	2.2	2.2
Moderately undernourished (18.5 to 16 cm)	33	8.9	8.9	11.1
Undernourished (23 to 18.5 cm)	153	41.2	41.2	52.3
normal or nourished (>23 cm)	177	47.7	47.7	100
Total	371	100	100	

MUAC (mid upper arm circumference) is the circumference of the left upper arm, measured at the mid-point between the tip of the shoulder and the tip of the elbow (olecranon process and the acromium). According to the table 9, highest 47.7 percent respondents had mid upper arm circumference of above 23 cm predicting normal or nourished health status. Lowest 2.2 percent respondents were seemed to be severely undernourished as their mid upper arm circumferences were less than 16 cm. Again, 41.2 percent respondents were seemed to be undernourished with mid upper arm circumference of 23 to 18.5 cm and 8.9 percent respondents were moderately undernourished with mid upper arm circumference of 18.5 to 16 cm.

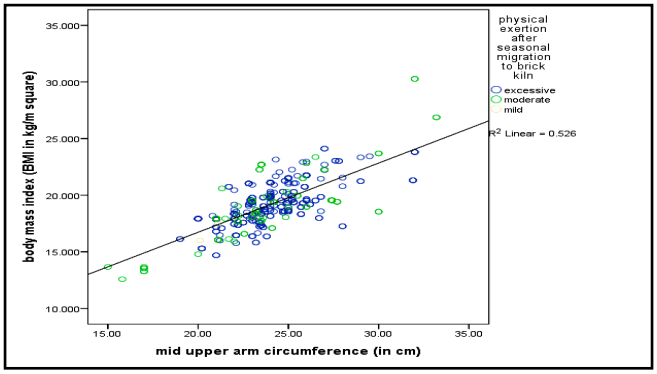

Figure 3: Scatter diagram with fit line showing association between MUAC and BMI

The scatter plots (in fig. - 3) show the BMI in respect to mid upper arm circumference by physical exertion after migration. From the above scatter plots, it is obvious that the workers with mid upper arm circumference between 22.5 to 32.5 cm. had normal BMI (18.5 to 25 kg/m^2). On the other hand, only two cases of mild physical exertion were found from the graph. That means two workers had performed mild physical exertion while working in brick kilns with moderately undernourished mid upper arm circumference and severely underweight BMI. The workers who were examined as very severely underweight had very severely underweight body mass index and able to performed moderate physical exertion in work. It can also be concluded that the workers with undernourished or nourished mid upper arm circumference had underweight or normal body mass index were able to perform excessive physical exertion in work than the other workers. The direction of fit line indicates that there was a strong positive association between mid upper arm circumference and BMI of workers. As the mid upper arm circumference of workers increased, their BMI was also increased and vice versa. It also displays the coefficient of determination, R^2. R^2 is the proportion of the variability in the dependent variable (BMI) shown on y axis that can be explained by the independent variable (mid upper arm circumference) shown on x axis according to physical exertion of workers. In case of mid upper arm circumference and body mass index of workers 52.6 % of the variability in BMI of workers can be explained by their mid upper arm circumference. The value of R^2 is 0.526 which is smaller than 1, means that the line fits 52.6 percent of the data. Closer the value of R^2 to 1, means better the line fits to the data and vice versa.

6. Vital Signs to Measure Physical Health of Workers

6.1 Blood Pressure

Table 10: Frequency and percent distribution of respondents according to blood pressure for adults

Classification of blood pressure	Frequency	Percent	Valid percent	Cumulative Percent
hypotension (systolic : <90, diastolic : <60)	27	7.3	7.3	7.3
desired (systolic : 90 -119, diastolic: 60 - 79)	118	31.8	31.8	39.1
prehypertension (systolic: 120 - 139, diastolic: 80 - 89)	125	33.7	33.7	72.8
stage 1 hypertension (systolic: 140 - 159, diastolic: 90 - 99)	78	21	21	93.8
stage2 hypertension (systolic: 160 - 179, diastolic: 100 - 109)	23	6.2	6.2	100
Total	371	100	100	

The above table – 10 shows that 33.7 percent respondents had prehypertension, 31.8 percent respondents had desired or normal blood pressure, 21 percent respondents had stage 1 hypertension, 7.3 percent respondents had hypotension and 6.2 percent respondents had stage 2 hypertension.

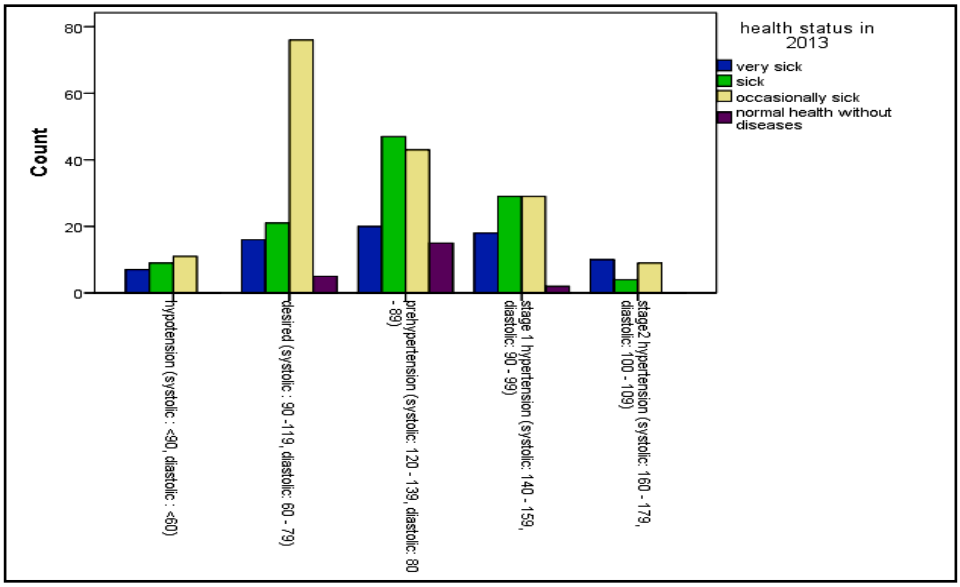

Figure 4: Bar chart showing health status of workers according to blood pressure

Blood Pressure Classification

The above bar chart (fig. – 4) displays that among workers who were examined desired blood pressure, highest workers felt occasionally sick next to workers suffering sickness, very sickness and normal health. In the prehypertension blood pressure group highest workers were sick followed by workers examined occasionally sick, very sick and normal health. In the stage 1 hypertension blood pressure group, highest workers were examined sick and occasionally sick followed by workers suffering from very sickness and normal health. Among the workers who were examined prehypotension blood pressure, highest workers of them were examined occasionally sick followed by sick workers and very sick workers. Highest workers in the stage 2 prehypertension blood pressure group were suffering from severe sickness followed by occasionally sick workers and sick workers. No normal health workers were found in the blood pressure groups of prehypotension and stage 2 prehypertension.

6.2 Pulse Rate

Table 11: Frequency and percent distribution of respondents according to categorization of pulse rate

Categorization of pulse rate	Frequency	Percent	Valid Percent	Cumulative Percent
weak pulse (40 to 60)	15	4	4	4
normal pulse (60 to 80)	190	51.2	51.2	55.3
fast pulse (80 to 100)	161	43.4	43.4	98.7
very fast pulse (>100)	5	1.3	1.3	100
Total	371	100	100	

Pulse rate is often measured to determine the general health status of a person. The above table – 11 displays that highest 51.2 percent respondents had normal pulse rate ranging 60 to 80 beats per minute and lowest 1.3 percent respondents had very fast pulse more than 100 beats per minute. 43.4 percent respondents were measured fast pulse rate ranging 80 to 100 beats and 4 percent respondents were measured weak pulse rate of 40 to 60 beats per minute.

For the average adult, a normal resting heart rate is between 60 and 100 beats per minute. Chances are the lower it is, the better cardiovascular fitness, and the more efficient the heart works. On the other hand, a new meta-analysis, published in the Canadian Medical Association Journal, has found a higher-than-average resting heart rate can lead to an increased risk of death from all causes, not just those related to heart. The association of resting heart rate with risk of all-cause and cardiovascular mortality is independent of traditional risk factors of cardiovascular disease, suggesting that resting heart rate is a predictor of mortality in the general population. A person's chance of death from any cause increased 9 percent for every additional 10 beats per minute, while risk of death from cardiovascular disease increased 8 percent for every additional 10 beats per minute.

The higher a person's heartbeat per minute, the greater their chance of death became. Those who had a resting heart rate of 80 beats per minute, for example, were found to have a nearly 45 percent increased risk of death from any cause, while those who had a resting heart rate of 60 beats per minute were found to have only a 21 percent higher risk.

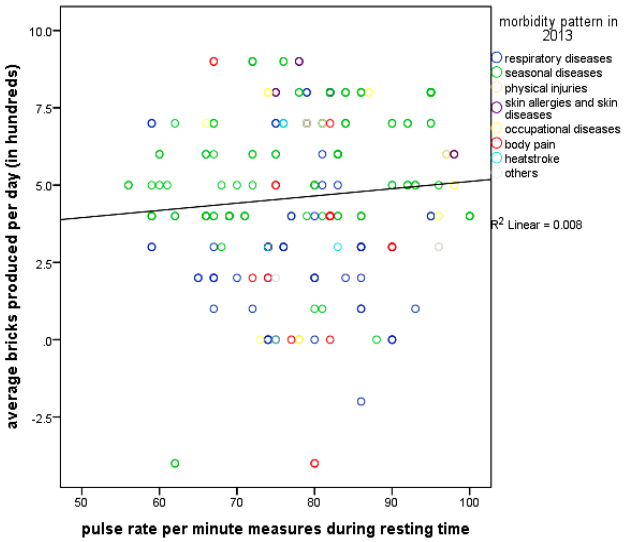

Figure 5: Scatter plots with fit line showing association ship between pulse rate and brick production by morbidity pattern of workers

The scatter plots in fig. – 5 show the brick production in respect to pulse rate of workers by their morbidity pattern (diseases suffered). The plots are scattering in the above graph indicating a small probability of positive linear relationship between pulse rate and brick production by workers. From the above scatter plots, it is obvious that the workers who had been suffering from respiratory diseases had pulse rates of 70 to 95 beats per minute and able to produced bricks not more than 500 bricks per day on an average. On the other hand, highest number of workers had been suffering from seasonal diseases with pulse rates between 58 to 90 beats per minute were able to produced bricks more than 500 bricks on an average per day. The workers who had suffered from occupational diseases with pulse rates of 70 to 100 beats per minute produced 300 to 800 bricks on an average per day. The workers who had suffered from skin diseases, headache and other diseases were produced bricks more than 500 on an average per day. Rare cases were observed in respect of physical injury, body pain, headache and other diseases among workers. The scatter plots beyond the 0 value represent workers other than pathera workers hence were not taken into account.

The direction of fit line indicates that there was a very weak positive association between pulse rate and brick production by workers. As the pulse rate of workers increased, their brick production was also increased and vice versa. It also displays the coefficient of determination, R^2. R^2 is the proportion of the variability in the dependent variable (brick production) shown on y axis that can be explained by the independent variable (pulse rate) shown on x axis according to sufferance of diseases. In case of pulse rate and brick production of workers only 8 % of the variability in brick production by workers can be explained by their pulse rate. The value of R^2 is 0.008 which is very smaller than 1, means that the line fits only 8 percent of the data. Closer the value of R^2 to 1, means better the line fits to the data and vice versa.

6.3 Respiratory Rate

Table 12: Frequency and percent distribution of respondents according to categorization of respiratory rate

Categorization of respiratory rate	Frequency	Percent	Valid Percent	Cumulative Percent
low (<12 breaths)	10	2.7	2.7	2.7
normal (12 to 16 breaths)	22	5.9	5.9	8.6
high (17 to 20 breaths)	135	36.4	36.4	45
very high (>20 breaths)	204	55	55	100
Total	371	100	100	

The above table – 12 shows that highest 55.0 percent respondents counted very high respiratory rates of more than 20 and lowest 2.7 percent respondents counted low respiratory rates of less than 12 breaths. Again, 36.4 percent respondents counted high respiratory rate of 17 to 20 breaths and 5.9 percent respondents counted normal respiratory rates of 12 to 16 breaths.

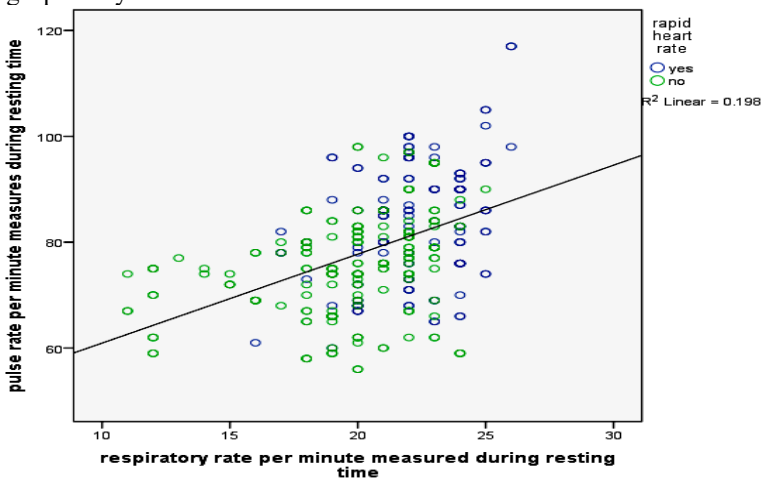

Figure 6: Scatter plots with fit line showing association between respiratory rate and pulse rate according to rapid heart rate of workers

The scatter plot graph in fig. – 6 show the pulse rate of workers by their respiratory rates according to rapid heart rates. The plots are scattering in the graph from lower left corner to the upper right corner of the graph indicating probability of positive linear relationship between respiratory rate and pulse rate of workers. There was a weak positive relationship existed between respiratory rate and pulse rate of workers as shown in the above graph. Increased in respiratory rate of workers would increase their pulse rate during their rest time. From the scatter plots (in fig 9.10), it is obvious that the workers who were examined rapid heart rates had high respiratory rate of 20 to 28 breaths per minute and also high pulse rates of 80 to 110 beats per minute at the time of taking rest after work. On the other hand, the workers who were examined no rapid heart rate had recorded a low respiratory rate of 10 to 22 breaths per minute with a low pulse rate of 55 to 80 beats per minute. The direction of fit line indicates that there was a positive correlation between respiratory rate and pulse rate of workers. As the respiratory rates of workers increased, their pulse rates were also increased and vice versa. It also displays the coefficient of determination, R^2. R^2 is the proportion of the variability in the dependent variable (pulse rate) shown on y axis that can be explained by the independent variable (respiratory rate) shown on x axis according to rapid heart rate. In case of respiratory rate and pulse rate only 19.8% of the variability pulse rates of workers can be explained by their respiratory rates. The value of R^2 is 0.198 which is smaller than 1, means that the line fits only 19.8 percent of the data. Closer the value of R^2 to 1, means better the line fits to the data and vice versa.

7. Sufferance from Diseases

Seasonal migrant respondent workers were asked question about their history of illness. 96.7 percent respondents reported that they had been suffering from diseases since 10 years and only 4.3 percent respondents had not suffered from diseases since 10 years.

Respondents were examined by physicians to know their morbidity status during their seasonal migration period in brick kilns. During their routine examination, the fact was derived that every respondent were suffering from one or more kinds of diseases. It was found that 72.8 percent respondents were suffering from fever, cold and cough and only 27.2 percent respondents hadn't suffered from these diseases.

50.4 percent respondents had been suffered from chest pain and severe cough with sputum indicating symptoms of TB. 49.6 percent respondents had not found the symptoms of TB. 75.2 percent respondents suffered from diarrhoea disease either before or after seasonal migration to brick kilns. On the other hand, 24.8 percent respondents reported that they had not suffered from diarrhoea in that year of seasonal migration. 74.1 percent respondents were found symptoms of eye irritation and other diseases while examined by physicians during a health camp in brick kilns. 76.5 percent respondents had suffered from body pain and 23.5 percent respondents didn't suffer from this disease. Skin disease was a common to the workers of brick kilns. 86 percent respondents suffered from skin disease and the remaining 14 percent respondents didn't complain of skin diseases. Occupational risk factors are one of the major causes of respiratory illness and symptoms, and accounted for 29.6 percent seasonal workers of chronic obstructive pulmonary disease. 68.7 percent respondents had been found suffering from nasal congestion disease and 31.3 percent respondents were not examined by such disease. 32.1 percent respondents were physically injured in accidents while working in brick kilns. On the other hand, 67.9 percent respondents were free from accidents in brick kilns. It was found that 77.6 percent workers had suffered from seasonal diseases in brick kilns after seasonal migration.

8. Mental Health of Workers

Apart from physical health experiences, workers were also asked to share about their mental health experiences. In general workers considered that they did not have very serious mental health issues. However, a detailed analysis of their responses has identified some important mental health issues that they experienced. These include hopelessness, loneliness, tension, depression and stress. Only 5.2 percent respondent workers felt hopelessness, 12.6 percent workers felt loneliness, 43 percent workers had suffered from tensions, 15.4 percent workers felt depression and 23.8 percent workers felt stress during their seasonal migratory period in brick kilns. A common belief among the workers was that the mechanistic lifestyle in the urban areas had adverse effects on their mental health status. Most of the workers (94.6 percent) believed that their busyness in work, accidents at work, being away from family, poverty and insufficient leisure time had caused these problems.

Young age groups and unmarried are at high risk of depression. Even some seasonal migrant workers who were already married and had children in native places had affairs or got married with other female workers of brick kilns in the working. The female workers often collected their salaries and the workers fell into a trap; and were depressed. Some migrants did not want to be labelled as having mental health problems nor did they want to see themselves as mentally ill but they quoted having symptoms that equated to mental illness or distress. A number of workers said they experienced stress or homesickness at specific times, for example around important religious festivals. They felt hopeless during a festive season in and missed their friends and family.

9. Conclusion

Majority of them ($3/4^{th}$) found to dominate by adults in the age group of 31 to 60 years who had been migrating to brick kilns since more than 15 years. They followed next by young male population in the age group of 19 to 30 years. Nine tenth of the seasonal migrant workers were living below poverty level with a very poor income and very poor standard of living which was not sufficient for their subsistence. In brick kilns they were engaged in different types of works such as patheras, zalaiwalas, nikashiwalas, mistrystaff and others. It was found that about three fourth of the seasonal migrant workers engaged in brick moulding work for which skilled workers were not required. Most of them were male. More than half of the workers used to work

since 20 years in the same profession. More than 3/4th of them used to chew tobacco. Very few workers smoked. More than half of workers used to consume alcohol. Workers who consumed addictive agents said they had it because of peer pressure, to relax mind and to work at quick speed. Musculoskeletal and respiratory problem and weakness are some of the common problems. Water from hand pump without purification was the major source of drinking water of seasonal migrant workers in brick kilns. Hence water borne diseases were common to them. Most of the seasonal migrant workers felt negative experience of seasonal migration and working in brick kilns. The literacy rate was found 36.8 % among the seasonal migrant workers of brick kilns which was very lower than the Jorhat district (83.42%) level, state level (73.18%) and national level (74.04%). The sex ratio was 145 females per thousand male workers among the seasonal migrant workers.

Based on the conclusive points the following recommendations can be adapted:

1) Preventive measures should be implemented against dust inhalation. Information, Education and Communication (IEC) should be utilized as a tool to create awareness among the brick workers.
2) Continuous usage of personal protective measures during the working hours will improve the quality of life.
3) Awareness should be created regarding causation, signs and symptoms, early diagnosis, treatment and if necessary advice about change of occupation.
4) Forming peer groups so as to give support and encouragement to quit smoking and alcohol consumption.

This research study concludes that a significant majority of seasonal migrant workers working in the brick kilns of Jorhat district experience a variety of health problems due to high pollution, unhealthy and unhygienic environment, work-related risks, unsafe and stressful working and living environments and rare medical treatment in addition to their poor dietary intake. The living and working conditions in the brick kilns appear harsh, but need to bear in mind that these are not necessarily much worse than those that the migrant workers have left behind in their home place. In the context of health facilities provided to workers, on owner's perception, majority of the brick kilns provided very poor to poor health facility to seasonal migrant workers.

The findings of this study have provided comprehensive evidence to academics, policy makers, trainers, educationalists, workers and employers. They were found completely in the state of impoverishment, economically and socially underdeveloped, physically and mentally in sickness who were the worst sufferers of the society. The findings of this research urge for an urgent need of to be focused on by policy makers to improve the existing health status of seasonal migrant workers.

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