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ENVIRONMENTAL HAZARDS ON AGRICULTURAL WORKERS: AN EXPLORATORY CROSS SECTIONAL STUDY

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ABSTRACT

Background: Occupational environmental hazards of rural agriculture workers can lead to various negative effects on health productivity. Health conditions of agricultural workers though important from public health point of view but very neglected topic which requires urgent attention.

Objective: To determine prevalence, patterns and predictors of environmental hazards of agricultural workers in relation to their work.

Methods and Material: A cross-sectional study was conducted in a rural area of the North 24 Parganas district in West Bengal. Multistage simple random sampling method was used to select total 302 agriculture workers for the study.

Results: Among all workers, 82 (27.1%) reported experiencing environmental hazards. Of these, 56 (18.5%) suffered from heat exhaustion and 26 (8.6%) was heat stroke. Significant associations were found between these hazards and various factors like age [OR: 2.31, 95% CI: (1.14-4.66)], addiction [OR: 1.94, 95% CI: (1.16-3.24)], duration of work [OR: 2.78, 95% CI: (1.65-4.70)], and type of work [OR: 2.63, 95% CI: (1.50-4.58)].

Conclusion: Farm workers had inherited a considerable burden of environmental hazards like heat stroke and heat exhaustion. First-aid educations and getting prepared for emergency

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situations can be helpful to minimize the detrimental effects of environment and minimization of hospitalization time.

Keywords: Rural agriculture workers, Environmental hazards, work duration, heat stroke and heat exhaustion.

INTRODUCTION

Agriculture is one of the most hazardous sectors globally, ranking alongside mining and construction in terms of risk [1]. In India, where agriculture is a crucial component of the economy, approximately 72% of the population lives in rural areas, with around 58.45% depending directly on agriculture for their livelihoods [2], [3],[4]. This sector accounts for about 25% of the country's GDP and supports 75% of the population. Prolonged exposure to environmental stressors in agriculture can adversely affect health, diminishing farmers' work capacity and their ability to manage and supervise effectively [5].

While previous studies in various regions of India have examined issues like pesticide exposure, equipment-related injuries, and mental health concerns, there has been a lack of comprehensive research focusing on occupational environmental hazards faced by agricultural workers in rural areas, particularly in West Bengal.

In light of this context, the current research was conducted to ascertain the prevalence of occupational environmental hazards and associated risk factors among agricultural workers in a block of West Bengal. The findings will aid health policymakers and administrators in implementing effective corrective measures through structured health services for the rural agricultural workforce. To determine the environmental hazards encountered by the agriculture workers. To find out the relationship between hazards and their activities. To investigate the explanatory and contextual factors related to the hazards faced by the study group.

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MATERIAL AND METHODS

Study Design, Area, and Period: This descriptive epidemiological study utilized a cross-sectional design, targeting agricultural workers in Habra Block-I of the North 24 Parganas District in West Bengal, conducted from October 2013 to September 2015.

Selection Criteria: The study included agricultural workers aged 18 to 60 years who had resided in the area for over a year. Excluded from the study were pregnant and lactating women, critically ill patients, and individuals who did not provide consent.

Procedure: The Institutional Ethics Committee approved the study. Researchers conducted interviews with participants in their homes or fields, obtaining written informed consent beforehand. Data was collected using a pre-designed and pre-tested questionnaire, which included demographic information.

Study Variables: Participants were asked about self-reported illness symptoms experienced in the year leading up to the survey, as well as any history of environmental hazards.

Sample Size: Based on a prior study indicating a 62% prevalence among agricultural workers in South India[6,] the estimated sample size was 105, calculated with the formula $n = Z\alpha^2pq/l^2$. Here, $Z\alpha = 1.96$ (at 95% confidence), p = 62%, allowable error = 15%, and q = (1-p). A simple random sampling approach was employed, and accounting for a design effect of 2.5 due to multistage sampling, the adjusted sample size became 263. An additional 15% was added to address potential non-responses, resulting in a total sample size of 302, collected using proportional probability sampling methods.

Statistical Analysis: Data was organized in an MS Excel spreadsheet. Analysis involved calculating percentages and means, with chi-square tests employed to assess associations between different variables. SPSS version 16.0 was utilized for both bivariate and multivariate logistic regression analyses.

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RESULTS

Table 1: Background information of study participants (n=302)

Socio-Demographic characteristics		Number (%)
Age (Years)	18-30	78 (25.8)
	31-40	95 (31.5)
	41-50	71 (23.5)
	51-60	58 (19.2)
Gender	**Male**	175 (57.9)
	Female	127 (42.1)
Religion	Hindu	265 (87.7)
	Muslim	37 (12.3)
Caste	ST	167 (55.3)
	SC	115 (38.1)
	Others	20 (6.6)
Educational status	Illiterate	207 (68.5)
	primary	65 (21.5)
	secondary	28 (9.3)
	higher secondary	2 (0.7)
Socio-economic status (Modified B. G. Prasad's)[a]	Class III	18 (6)
	Class IV	111 (36.8)
	Class V	173 (57.2)

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Marital status	Single	8 (2.6)
	Married	294 (97.4)
Type of family	Nuclear	74 (24.5)
	Joint	228 (75.5)
Addiction	Alcohol	129 (42.7)
	Smoking	106 (35.1)

***a*= None of the study participants belonged to SES Class I and II**

Table 2: Distribution of study participant according to duration of work (n=302)

Duration of work	Number	Percentage
Less than 8 hour	128	42.4
8 hour or more	174	57.6
Total	**302**	**100**

Table 3: Distribution of study participant according to type of work (n=302)

Type of workers	Number	Percentage
Sedentary workers	61	20.2
Moderate workers	111	36.8
Heavy workers	130	43
Total	**302**	**100**

Table-4: Distribution of study participant according to environmental hazards (n=302)

Type of workers	Number	Percentage
Heat stroke	26	8.6
Heat exhaustion	56	18.6
Snake bite	26	8.6
Pesticide Poisoning	13	4.3
None	181	59.9

Table 5: Association of environmental hazards with type of workers (n=302).

TYPE OF WORKERS	ENVIRONMENTAL HAZARDS	SIGNIFICANCE			
	Heat stroke	**Heat exhaustion**	**None**	**Total**	Chi square
	n(%)	**n(%)**	**n(%)**	**n(%)**	
Sedentary	3(4.9)	2(3.3)	56(91.8)	61(100)	15.12
Moderate	9(8.1)	25(22.5)	77(69.4)	111(100)	

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Heavy	14(10.8)	29(22.3)	87(66.9)	130(100)	
Total (%)	**26(8.6)**	56(18.5)	**220(72.7)**	302(100)	

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Table 6: Predictors of environmental hazards (n=82) suffered by the study population; Bivariate and multivariate logistic regression.

INDEPENDENT VARIABLE	ENVIRONMENTAL HAZARDS	BIVARIATE MODEL	MULTIVARIATE MODEL
	N (%)	OR (95%CI)	AOR (95%CI)
Age			
≤30yrs	11(13.4)	1	1
>30yrs	71(86.6)	2.31(1.14-4.66)	1.99(0.89-4.45)
Sex			
Female	40(48.8)	1	1
Male	42(51.2)	1.45(0.87-2.42)	1.14(0.58-2.55)
Caste			
SC and Others	40(48.8)	1	1
ST	42(51.2)	1.38(0.83-2.99)	1.11(0.60-2.03)
Education			
Literate	23(28)	1	1
Illiterate	59(72)	1.24(0.71-2.18)	1.22(0.59-2.55)
Type of family			
Nuclear	16(19.5)	1	1
Joint	66(80.5)	1.47(0.79-2.75)	1.85(0.89-3.84)
PCI			
Class IIIandIV	32(39)	1	1
Class V	50(61)	1.23(0.73-2.06)	1.84(1.02-3.34)
Addiction			
No	35(42.7)	1	1
Yes	47(57.3)	1.94(1.16-3.24)*	2.08(1.09-3.95)
Severity of work			
Others	14(17)	1	1
Heavy	68(83)	2.63(1.50-4.58)*	1.75(1.02-3.33)
Duration of work			
≤8 hrs	22(26.8)	1	1
>8 hrs	60(73.2)	2.78(1.65-4.70)*	2.53(1.37-4.67)

For the multivariate model, the Hosmer–Lemeshow test gave chi- square-value of 2.11, df=8, (p = 0.97, not significant) indicating good model fit.

*Significant variables bivariate and multivariate analysis.

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RESULT AND DISCUSSION

In our study, we found that 57.9% of the workers were male. The male to female ratio stood at 1.38:1.When we looked at religion around 87.7% identified as Hindu. Breaking it down by caste, 55.3% were Scheduled Tribes (ST) while 38.1% were Scheduled Castes (SC). 68.5% were illiterate followed closely by those with just a primary education. Most of these workers (57.2%) fell into the Class V socio-economic status according to B.G. Prasad's scale (See Table-1). In a related study by Kulkarni Rajesh R et al [6] found similar trends: 55.75% of participants were men and male to female ratio of 1.25:1. A large share of agricultural workers (89.5%) was also Hindus, with 47% being illiterate; among them, 295 workers (73.75%) belonged to Class V socio-economic status. Most workers in our study came from lower socio-economic backgrounds. Many women worked mainly to earn extra money for their future and to support their families during seasonal times [7]. In India, lots of agricultural workers are from scheduled castes & tribes; too often, these marginalized groups struggle to claim their rights [8].

When we looked into environmental hazards, we saw that 27.1% suffered from heat-related issues, 18.5% had heat exhaustion while 8.6% faced heat stroke (See Table-4) and it's interesting to note that heavy laborers faced more environmental hazards compared to moderate or sedentary workers; the statistics clearly showed this was significant [chi square=15.12, df=4, P=0.00] (Table-5). Now, regarding older farmers those over 30 years old they suffered significantly more from heat exhaustion and heat stroke [OR:2.31, 95%CI: (1.14-4.66)]. Those with a history of addiction also showed higher risks [OR: 1.94, 95%CI: (1.16-3.24)]. Furthermore, farmers working more than eight hours saw increased risk levels [OR: 2.78, 95%CI: (1.65-4.70)], as did heavy laborers [OR: 2.63, 95%CI: (1.50-4.58)]. Adjusting for other factors revealed that low socio-economic status increased the burden of hazards significantly [AOR: 1.84, 95%CI: (1.02-3.34)] along with addiction history [AOR: 2.08, 95%CI: (1.09-3.95)] and long working hours [AOR: 2.53, 95%CI: (1.37-4.67)] as well as heavy workloads [AOR: 1.75, 95%CI: (1.02-3.33)] (See Table-6). A study by Barrow AE et al [9] indicated that mortality rates from heat stroke can range between 10%-20%. This means there are hundreds or even thousands affected each year! Their findings also highlighted that agricultural workers felt the heat more due to exposure in summer combined with limited resources and inadequate knowledge about proper clothing during these hot months [10], [11]. Heat stress can depend on so many factors not just weather conditions but also age, what kind of work is done, what people

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wear & how well they take care of themselves nutritionally as well! Manual laborers doing heavy work in hot environments are particularly at risk because they generate lots of internal heat while also absorbing it from their surroundings [12]. Another study by Xiang J et al [13] pointed out that workers in certain countries face higher risks due to density in population & large informal job sectors present already high chances for excessive heat exposure because of climate change impacts too! Harlan et al [14] found that areas with high poverty rates had significantly higher scores on a human thermal comfort index this basically indicates heat vulnerability levels among populations who earn less money or have fewer educational achievements. Related findings from Newark & Camden in New Jersey [15] showed that lower-income neighborhoods faced even greater risks.

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CONCLUSION

Despite these limitations, this study identified some important factors that need attention. This research revealed not only the high prevalence of occupational related hazards among the study population, but also the occurrence of a large population with modifiable risk factors like alcohol consumption, smoking, high load and long duration of work, poor personal hygiene, non-use of personal protection equipment (PPE); the latter if taken care will definitely reduce hazards of the agriculture workers.

Therefore, targeted interventions that promote healthy lifestyles and reduce the risk factors, along with early diagnosis and treatment will help in ameliorating the suffering of these personnel of the agriculture sector who are actually feeding the whole nation. This is the key to turn India into one of the foremost nations of the world. So let us all rise and come forward to bring smile to each and every individual who works in the field, making this occupation honorable, healthy and happy.

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