

Original Research Article

Prevalence of occupational skin diseases among rice field workers in Haryana

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ABSTRACT

Background: The objective of the study was to estimate the risk of occupational skin diseases among workers who were exposed to animal manure during rice cultivation in India.

Methods: Questionnaire based six month follow up study with weekly assessment of skin diseases in rice field workers from village Dabra, in Haryana state of India who were exposed to animal manure was carried out among the agricultural workers working in rice field along with dermatological examination of exposed parts.

Results: Out of total 574, workers, 90 were excluded as per exclusion criteria. 71 workers out of 370 workers who were free from diseases at baseline survey data develop a new disease with cumulative incidence of 19.1%. There was higher prevalence of dermatitis among all of reported skin diseases.

Conclusions: Exposure to animal manure mixed with standing water is a major risk factor among the workers working in rice field and attempt should be made to identify the type of dermatitis and relate its causative agent with any specific biological or chemical agents present in animal manure mixed with standing water of rice field.

Keywords: Skin diseases, Occupational diseases, Animal manure, Cohort study

INTRODUCTION

Dairy animals produce about 12.0 gallon of fresh manure (faeces and urine) per 1,000 lb average live weight per day.¹ The addition of animal manures to soils have a direct effect on soil organic matter content, can improve soil fertility, soil physical characteristics, and facilitate microbial activities.²⁻⁴ Addition of cow dung increases nitrogen content and decreases pH of soil.⁵ In recent times, organic manures in conjunction with or as an alternative to chemical fertilizers as a source of plant nutrients for cultivation of field crops has received worldwide recognition because of rising costs of chemical fertilizers, rapid nutrient loss of added fertilizers and inauspicious environmental impacts from inorganic fertilizers.⁶⁻⁷ Human health risks may be caused due to use of wastewater and excreta in agriculture, although the risk for certain gastrointestinal diseases like helminthiasis has been established, the information on

other potential human health risks is still unknown.⁸ Studies in many countries on farmers using wastewater suggested a high prevalence of the skin diseases.⁹⁻¹¹ In general, main causes of these skin ailments remained unknown.¹² Also, workers involved in manual handling activities (e.g. cleaners) often complain about skin diseases caused by various irritants and allergens, like sun, bacteria as biological agent and chemicals including pesticides and heavy metals.¹³⁻¹⁸ India is one of the leading producer of rice and Haryana is second largest contributor to India's central pool of food grains.^{19,20} The 'Green Revolution' in the state gave a major boost to the growth of rice production.²¹ Agricultural workers suffer from highest numbers of skin diseases out of all industrial sector workers since the skin of workers are in direct contact with materials at workplace.²² As the rice field workers work for long duration in rice fields where the environmental conditions are conducive to growth of microorganisms, therefore, need for research on

prevalence of skin diseases in those rice field workers who are exposed to animal manure mixed with standing water is desired.

METHODS

Study area

Village Dabra was selected as study area. The native language of workers is Hindi (National language) but most of people speaks the Haryanvi dialect (Local Language). Rice crop is usually sown with the beginning of the first rains in May-July, during the south-west monsoon season. Dabra is a large village located in Hisar district, Haryana with total 869 families residing. Out of total population, 1709 were engaged in work activities. 84.61 % of workers describe their work as Main Work (Employment or Earning more than 6 Months) Out of 1709 workers engaged in Main Work, 574 were totally dependent on Agriculture.²³

Period of study

During May 2016 to October 2016 (6 months)

Selection criteria

Male and female workers employed in agricultural work for the last 5 years were included in present study. Part time workers were excluded from the study. Pregnant and lactating females were also excluded from present study.

Ethical aspect

Study was conducted according to guidelines of indian council of medical research(ICMR) after obtaining permission in written from Institutional Ethics Committee of GJUS&T, Hisar and local authority(village head/Sarpanch).Consent were obtained from each and individual human subject in written and their identity was not disclosed. Every member of study population who reported any skin disease were sanctioned to physical examination by dermatologist and treatment free of charge

Questionnaire

Questions were designed and selected in accordance with the Nordic Occupational Skin Questionnaire (NOSQ-2002), an internationally validated questionnaire for surveys on occupational skin diseases and exposure to environmental factors and was made understandable by workers in their local understandable language.²⁴ Study workers were followed weekly for kharif season duration (6 months) by a team of health workers. At the first visit of agricultural site, questionnaire was used to access their baseline data about history of occupational skin diseases if any, along with detail regarding working environment and different agricultural activity performed by them on regular basis. On every subsequent week, workers were

visited to obtain information about the status of their reported skin disease and exposure during work.

Data analysis

Skin diseases were expected to be recurrent in nature as they are constantly exposed to occupational hazard, so the person who reported one or more skin diseases at any of interview was considered one response. NOSQ score was calculated based on subjects' response. Results were analyzed statistically to evaluate the level of significance. Information from the questionnaire was coded and entered into SPSS version 16 software. Cumulative incidence was calculated and considered as measure of disease frequency. Univariable analysis using modified poisson regression were performed for estimation of possible association between the outcome variable of our interest (occupational skin disease: yes/no) and explanatory variables.²⁵ Variables with P value <0.5 were considered statistically significant.

RESULTS

Characteristics of study population

Study cohort consists of all 574 individuals who were totally dependent on agriculture. Out of these, 90 were excluded as per exclusion criteria. A baseline survey (before the start of study) was done In this, questionnaire were presented to 484 workers out of which 290 were those workers who were exposed to animal manure mixed with standing water in their rice field and 194 were exposed to standing water only and data were collected which include detail about their age, sex, education and type of exposure. There was no difference between two groups in respect of distribution of their age, sex, education and are described in Table 1.

Baseline data from questionnaire

Majority of workers from the group of animal manure user perform their wet work in standing water mixed with animal manure because majority of workers from both groups cultivated rice as main kharif crop and very few workers work in other kharif crops which don't require wet work. At the start point of study 33% workers from animal manure user group reported in questionnaire that they ever had skin diseases as compared to 12% of second group. Workers from animal manure user explained that contact with material at their workplace cause worsening of their skin diseases. Most common worsening agent were standing water mixed with animal manure (163),standing water (147), dry animal manure (6),But in second group (143) mentioned the standing water as possible cause which make their diseases worse. Out of total 44.0 % reported itching after work of harvesting and thrashing means non wet work and 61.8% reported itching after wet work. Some workers from both groups (15 from animal manure user) and (11 from animal manure non-user) reported that contact with

certain material outside their work make their diseases worse. Out of total, 46% show improvement in diseases when they were away from field work. In group of workers exposed to standing water only 53% improvement occurs when away from field work. In first visit, workers were asked to tell about their reported

symptoms of possible skin disease and finding were itching, burning sensation on exposed area of body, pus formation, redness, pain, small wound, mosquito bite, and itching after sweat on exposed parts of body. Characteristics of symptoms of possible skin disease as mentioned during first visit are shown in Table 2.

Table 1: Characteristics of study population as reported during baseline data.

Animal manure user (n=290)			Animal manure non-user (n=194)		P-value*
Characteristics	(n)	(%)	(n)	(%)	
Mean age	32		33		
Gender					
Male	163	(56.20)	109	(56.18)	<0.05
Female	127	(43.79)	81	(41.75)	<0.05
Education					
Not educated	51	(17.58)	29	(14.94)	<0.05
Educated	239	(82.41)	161	(82.98)	<0.05
Exposure					
Standing water only	0	(0)	149	(76.80)	<0.05
Animal manure only	4	(1.37)	0	(0)	<0.05
Standing water mixed with animal manure	221	(76.2)	0	(0)	<0.05

(*P value based on chi-squared test)

Table 2: Characteristics of workers reporting skin disease from baseline data.

Animal manure user (n=290)			Animal manure non-user (n=194)		P-value
Characteristics	(n)	(%)	(n)	(%)	
Time of last skin disease occurrence					
At Present	152	(52.4)	129	(66.5)	<0.05
Within last one month	89	(30.7)	28	(14.4)	<0.05
Between 1 and 3 months ago	33	(11.3)	25	(12.9)	<0.05
More than 3 months ago	16	(5.6)	12	(6.2)	<0.05
Localisation of skin diseases					
Feet	164	(56.5)	103	(53.0)	<0.05
Leg	107	(36.9)	93	(47.9)	<0.05
Hand	49	(16.9)	19	(9.8)	<0.05
Forearm	09	(3.10)	07	(3.6)	<0.05
Nature of work at time of skin diseases					
Wet Work	248	(85.5)	139	(71.6)	<0.05
Other than wet work	42	(14.4)	55	(28.3)	<0.05
Treatment required					
Yes	114	(34.6)	51	(22.9)	<0.05
No	215	(74.1)	170	(76.5)	<0.05

Incidence of new skin diseases

Study population consist of workers who were free from skin disease at time of first visit in May, 2016 and then over six month period of study, skin diseases were reported 1074 times by 123 workers with 78 from animal manure user group and 45 were from second group of workers. At starting point of study, 96 workers had a skin diseases out of 484 so they were not included and 18 left from the follow-up (follow up period <22 weeks). Out of these only 370 were available for further analysis.

Overall cumulative incidence of occupational skin diseases was found to be 19.1%. 71 workers out of 370 developed a new skin diseases (in group of animal manure user, 49 workers with 125 reports and 22 workers from animal manure non user group with 59 reports).It shows highly significant difference (RR= 1.20, 95% CI).

Physical examination

Out of 123 workers who reported about skin diseases at first visit, over six month follow up study, 96 turned up

for physical examination before dermatologist. 96 workers were appeared for 266 times before dermatologist. Out of which 187 were from animal manure user group and 79 from non-user group. Age of registered patient range from 18 to 50 years with mean age of 37.2 and out of total, 76% was male. Dermatitis was the most common skin diagnoses but other were in

small no and most cases were of workers from group of animal user (Table 3). Most affected workers were from group of animal manure user mostly affecting exposed area of their body particularly feet and legs. Similarly fungal and bacterial skin diseases mostly affected feet and legs. Paronychia was common in nails of feet while urticaria was common on forearm of workers.

Table 3: Occupational skin disease after diagnosis of patient by dermatologist.

Animal manure user (n=290)		Animal manure non-user (n=194)		P-value	
Skin diseases Diagnosis	(n)	(%)	(n)		(%)
Dermatitis	67	(23.1)	17	(9.0)	<0.05
Fungal skin diseases	40	(13.8)	7	(3.8)	<0.05
Bacterial skin diseases	41	(14.0)	8	(4.1)	<0.05
Urticaria	3	(1.1)	1	(0.6)	<0.05
Paronychia	14	(4.6)	7	(3.4)	<0.05
Other skin diseases	1	(0.4)	1	(0.6)	<0.05

Table 4: Univariable analysis of risk factors for occupational skin diseases in 370 workers.

Variables	Skin diseases	No skin diseases	Cumulative incidence	Relative risk(RR)
Gender				
Male	76	152	33.3	0.95(0.58-1.54)
Female	43	99	30.0	1
Age				
< 35 years	171	99	63.3	0.78(0.51-1.20)
> 35 years	81	19	81.0	1
Socioeconomic status				
Low	66	132	33.3	1.03(0.193-5.487)
High	56	116	32.4	1
Education				
Not educated	190	80	70.4	1.17(0.66-2.05)
Educated	60	40	60.0	1
History of Disease				
Yes	170	60	73.9	1.29(0.77-2.16)
No	80	60	57.1	1
Involved in agriculture				
Yes	169	81	68.0	1.02(0.63-1.65)
No	80	40	66.7	1
Animal manure exposure				
Yes	86	31	73.7	1.20(0.76-1.90)
No	155	98	61.1	1
Wet work				
Yes	240	110	68.6	1.37(0.33-5.58)
No	10	10	50.0	1
Body washing after work				
Infrequent	200	60	76.9	1.69(0.85-3.34)
Frequent	50	60	45.5	1

Risk factors for occurrence of skin disease

Risk factors were assessed from univariable analysis for developing skin diseases with various risk factors like gender, age group, education, previous history of any skin disease, socioeconomic status, education, animal manure exposure, involvement in agriculture in general,

wet work and habit of body wash after work and the result were obtained in terms of (RR) relative risk (Table 4). Working in contact with standing water mixed with animal manure was significantly associated with occurrence of skin diseases. Assessment of exposure to animal manure mixed with standing water from baseline data at first visit and during weekly monitoring of contact

with animal manure using the scoring system proclaimed the same results regarding skin diseases. Involvement in agriculture, in general and wet work in field were significantly associated with risk of skin diseases. Gender and age group of workers was not significantly associated with risk of skin diseases. Education and socioeconomic status were factors significantly associated with occurrence of skin diseases. Habit of infrequent body washing after work and previous history of any skin diseases were strongly associated with risk of occurrence of skin diseases

DISCUSSION

This study showed a clear difference in the occurrence of occupational skin diseases (dermatitis) between two groups of workers and exposure to animal manure mixed with standing water of rice field appeared to be an important factor for this difference. Most of farmers prefer to store cattle dung usually in stockpile on farms for many months.²⁶ Stockpiles consist of heaps of solid cattle dung manure above ground.²⁷ Stored manure will eventually be applied on land manually by broadcasting method (spreading the manure evenly on top of the soil). When crop is irrigated, microorganisms in stored manure decompose the organic matter and release a number of pollutants in water.²⁸ The greatest proportion of emissions from manure takes place because it is concentrated and continuous, putting field workers at high risk.²⁹ Agricultural workers suffer from a large number of occupation related hazard skin diseases may be caused due to standing water in rice field which is the major risk factor and irritant³¹ along with sun exposure during sowing of seed, harvesting, weed removal, irrigation of field, and harvesting.³⁰⁻³² Dermatitis may be caused due to contact with plant leaves during weed removal and threshing. Skin lesions and small cuts are caused either due to spiky nature of leaves also due to any thorn present in mud, or due to strong ammonia. Ammonia gas can cause severe skin irritation or burns due to its high solubility in water. Because of this, skin irritation can occur after sweating if the skin is in contact with ammonia.³³ Irritation due to ammonia can also affect eyes, causing watering and lead to Glaucoma after a long-term exposure to ammonia.³⁴⁻³⁵ India possess hot climate due to which maximum numbers of workers prefer to work barefoot and without protective gloves. Manual workers may suffer from a skin infection of the fingers, known as paronychia.³⁶ All this scenario along with lack of education and awareness about severity of occupation related disease make high prevalence of occupational skin diseases in rice field workers of Haryana. According to an earlier report, self reporting of skin diseases is good indicator of prevalence of skin diseases in agricultural workers.³⁷ Human subjects in rural Haryana were more willing to participate in interview based study as compared to other method of intervention.³⁸ All physical, biological and chemical factor like hot and humidity caused due to standing water as irritant and sunlight, can play role in occurrence of skin diseases.³⁹ In an earlier

report conducted on paddy field workers of southern India, low prevalence of dermatitis were shown while in our study paddy field workers in Haryana showed maximum prevalence of skin dermatitis.³² Some pathogens like virus, bacteria and parasites in animal manure pose potential risks to human health.⁴⁰

CONCLUSION

The present study shows different types of skin diseases commonly occurred due to occupation related factors in agricultural workers. Observation and discussion with workers result in conclusion that agricultural workers perform more manual labour and remained in continuous contact with standing water, spiky leaves, and intense sunlight along with animal manure, but we cannot define exact cause of all these reported symptoms. Based on this study, further research work will focus on identification of type of dermatitis and their relation with particular biological or chemical substance present in mixture of animal manure and standing water.

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Conflict of interest: None declared

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