Pattern of Skin Diseases and Occupational Dermatoses among Paddy Field Workers in Kashmir Valley: A Cross-Sectional Study from North India

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Abstract

Introduction: Paddy farming is one of the main occupations in Kashmir valley. The workers associated with paddy are exposed to variety of irritants such as manures, fertilizers, and pesticides, besides getting exposed to intense sunlight for long hours due to the nature of their work. All these factors can potentially either trigger skin diseases or can worsen them. Aim: The aim of this study was to find out the prevalence and pattern of various skin disorders among paddy field workers in Kashmir valley. Materials and Methods: This was a cross-sectional descriptive study in which 600 workers engaged in paddy farming in different areas of Kashmir valley were screened. The diagnosis was made on clinical grounds and wherever deemed necessary, relevant investigations were carried out to establish the nature of the disease. Results: A total of 600 workers were evaluated for the presence of skin disorders. Two hundred thirty workers (38.3%) were found to have skin lesions, while the rest, i.e. 370 (61.7%) were free from any skin problem. Out of the total skin lesions, infectious ones were seen in 40.4%, while non-infectious accounted for 59.6% cases. The main non-infectious disorders included melasma, followed by hand and foot eczemas, hyperkeratosis of palms and soles and calllosities/cuts, while among the infectious group the major chunk was formed by bacterial infections followed by fungal, viral, and parasitic. Pitted keratolysis and intertrigo were the most common bacterial and fungal infections respectively. Conclusion: A large number of skin diseases were seen in paddy field workers, with some diseases showing an occupational nature.

Keywords: Animal manure, melisma, occupational dermatoses, paddy field workers, pitted keratolysis

Introduction

Agriculture has a great bearing on public health. While agricultural intensification can support food security and socioeconomic development, it may also have adverse effects on varied dimensions of public health. For instance, the intensive use of chemical fertilizers and pesticides for crop production can increase the occupational exposure of farmers to chemical and pesticide residues, while also placing pressures on ecosystems through excess residues and toxins in the ground water.

Agriculture is an important occupation in Kashmir valley with rice being the staple food of majority of the people. Rice cultivation includes seed sowing, creation of nursery, plantation, harvesting, threshing, sun-drying, husking, and winnowing. As is evident from medical literature, paddy field workers are exposed to various agents, namely, irritants such as mud, fertilizers, pesticides, cow dung, and dust from the dried plants and grains during threshing. At many places, waste-water is used leading to high prevalence of skin diseases among farmers. In addition, during the ploughing and planting season, and sometimes in the harvesting season, the feet are constantly immersed in water. All these factors can predispose workers to dermatoses of face, hands and feet, and also to various bacterial and fungal infections. This

How to cite this article: Bashir S, Hassan I, Wani RT, Zeerak S, Shah FY. Pattern of skin diseases and occupational dermatoses among paddy field workers in kashmir valley: A cross-sectional study from North India. Indian J Community Med 2021;46:610-3.

Received: 15-05-20, Accepted: 26-08-21, Published: 08-12-21
study was carried out to determine the prevalence and pattern of skin diseases among paddy field workers in Kashmir Valley.

Materials and Methods

It was a cross-sectional (descriptive) study, in which 600 paddy field workers across different areas of Kashmir valley were screened over a period of 2 years (April 2017–September 2019). Sample size was calculated using Epi Info (Epi Info Statistics for Windows, Version 7.1.5.2. Atlanta, Georgia, USA). Considering a Type 1 error of 5% and an allowable error (absolute) of 3%, and keeping into consideration the prevalence of various outcome factors (dermatoses in paddy field workers) as available from review of literature, sample size of 544 was calculated to estimate a dermatoses with anticipated prevalence of 15%. This was increased by a factor of 1.1 to allow for non-responses. Thus, a final sample size of 600 was chosen for the study. The study protocol was approved by the institutional ethical committee; and all the recruited patients willingly signed a written informed consent to be a part of the study.

Demographic and clinical data including patient’s age, sex, number of years and average number of hours spent on fields per day, use of any protective measures during work, exposure to any irritant and type of skin lesion were noted and recorded on specially designed pretested pro formas. Relevant laboratory investigations and specialized tests were carried out in selected patients wherever deemed necessary.

Exclusion criteria included: (1) field workers other than those related to paddy like fruit growers, mustard growers, maize growers etc., (2) workers with family history of skin diseases, and (3) workers who had a skin disorder before entering into the practice of paddy farming.

Statistical analysis

The data at the end of the study were analyzed by SPSS (IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY, USA: IBM Corp.). A binary logistic regression was performed in order to find the association between exposure and outcome variables.

Results

Out of the total 600 paddy field workers, 400 (66.7%) were involved in using different irritants such as farmyard manure, cow dung, and fertilizers, during their daily work, while the rest 200 (33.5%) did not remain in touch with any such irritant. This difference was attributed to nature of work distribution on field – those involved in seed sowing, creation of nursery, plantation, and weeding had irritant exposure, while those involved in harvesting, threshing, sun-drying, husking, and winnowing were free from such exposure. Ninety workers (15.0%) were found to use protective measures (such as boots, gloves, and facial masks) while working on the fields while majority of the workers (510, 85.0%) did not observe any such precautions. Among the total number of 600 paddy farm workers screened, 230 (38.3%) were found to have skin lesions while the rest i.e. 370 (61.7%) were free from any skin problem.

The cutaneous manifestations observed in the study group were divided into infectious and noninfectious dermatoses, as detailed in Table 1. Among the noninfectious group, the largest subtype was constituted by melasma (19.2%), followed by hand and foot eczemas (9.2%), hyperkeratosis of palms and soles (7.5%), and callosities/cuts (6.5%). Among the infectious group, pitted keratolysis comprised the largest group (16.5%), followed by intertrigo (6.5%), paronychia (6.1%), pityriasis versicolor (2.7%), and onychomycosis (2.2%). Of note, bacterial infections were more common than fungal infections.

Patch testing was done in 12 suspected cases of allergic contact dermatitis using Indian Standard Series of 20 antigens approved by Contact and Occupational Dermatitis Forum of India. Out of these cases, positive patch test results were obtained in five workers for four allergens (thiuram mix, nickel sulphate, paraphenylene diamine, and potassium dichromate) with a total of seven positive patch test reactions. A maximum...
Table 2: Association between various variables and the presence of skin diseases among paddy field workers

| Variable                          | Skin disorder present (n=230), n (%) | Skin disorder absent (n=370), n (%) |
|-----------------------------------|-------------------------------------|------------------------------------|
| Average hours spent/day in fields (h)* |                                     |                                    |
| 3-<6                              | 42 (25.00)                           | 126 (75.00)                        |
| 6-<9                              | 152 (42.20)                          | 208 (57.80)                        |
| 9-12                              | 36 (50.00)                           | 36 (50.00)                         |
| Usage of manures/cow dung/fertilizers* |                                     |                                    |
| Using                             | 181 (45.30)                          | 219 (66.20)                        |
| Not using                         | 49 (24.50)                           | 151 (75.50)                        |
| Use of protective measures (footwear/gloves/facial masks)* |                                     |                                    |
| Using                             | 13 (15.00)                           | 77 (85.00)                         |
| Not using                         | 217 (42.50)                          | 293 (57.50)                        |

Significant: *P<0.001

number of reactions were for thiram mix and nickel sulfate probably because the workers might get sensitized to these allergens from sources like rubber, fertilizers, and farm equipment.

Associations accounted for higher prevalence of skin diseases among farmyard manure/cow dung/fertilizer users and also among those who spent more time working on fields. However, use of protective measures reduced the prevalence of skin diseases among participants [Table 2]. The results from binary logistic regression clearly showed that the association of dermatoses with various variables did not vary grossly by age and gender [Table 3].

**DISCUSSION**

This study was a cross-sectional descriptive study, carried over a period of 2 years, in which 600 paddy field workers were screened for various skin diseases and occupational dermatoses. The male: female ratio was of 2.3:1, thus indicating that the occupation has predominance of males. This corresponds to the masculine nature of the job-like plowing, preparation of land, and spraying insecticides which is done usually by males in every society. The majority of workers (60.0%) worked for 6–9 h/day. This observation corresponds to the nature of paddy farming which is time bound and as such requires extensive labor during sowing and harvesting seasons. The maximum workers (67%) were engaged in paddy farming for a period >10 years. This corresponds to the fact that rice, being the staple food in Kashmir, has a high consumption and therefore people have been practicing paddy farming from long time to remain self-sufficient in terms of food grains as well as for economic gains. A small proportion of workers (15.0%) used protective measures such as gloves/footwear/facial masks during sowing/harvesting while the rest did not observe any such precaution. This could be due to the lack of health-care awareness, financial constraints as well as low availability of such items in the local market.

In this study, the prevalence of skin disorders found in these workers was 38.3%, among which infectious dermatosis were seen in 40.4%, while noninfectious disorders were seen in 59.6% cases. The burden of infectious skin diseases may be due to the fact that the paddy field workers of our region have to work under improper sanitary conditions and some of the workers are not aware about the various modes of acquiring infections. The higher use of decomposed animal manures in our region further adds to the risk of acquiring infections. When crop is irrigated, microorganisms in stored manure decompose the organic matter and release a number of pollutants in water putting the field workers at high risk. This explains the higher prevalence of skin diseases among paddy field workers who use farmyard manure/cow dung (45.3%) when compared to those who do not use such organic manures (24.5%).

Pitted Keratolysis was the most common bacterial infection. The prevalence of pitted keratolysis, as reported in various studies, ranges from 1.5% of 4325 Korean industrial worker to 2.25% (11 of 490 subjects randomly evaluated) in New Zealand.[5,6] In a study by Shenoi et al., pitted keratolysis was reported to be the most common infective skin disease among paddy field workers.[7] In our study, pitted keratolysis was reported to have a prevalence of 6.3%. This could possibly be due to barefoot walking on the fields and exposure to moist environment, both being the risk factors for developing pitted keratolysis. All this help us to propose that pitted keratolysis could be an occupational dermatosis in the paddy field workers of our region.

There were a high proportion of fungal infections which accounted for 12.6% of the total skin diseases. This figure of 12.6% is slightly greater than the prevalence of fungal infections (11.3%) seen in the Kashmiri population by Masood and Hassan.[8] The greater prevalence of fungal infections among paddy field workers could be attributed to high summer temperatures, high humidity, and prolonged submergence of feet underwater which all favor the growth of fungal pathogens.

Among the noninfectious diseases, melasma formed the major group accounting for 19.10% of all the skin diseases. The high proportion of melasma cases, as compared to 1.8% reported by Masood and Hassan[8] could be due to exposure of paddy field workers to intense solar radiation while working in fields for long hours.

Hand and foot eczemas accounted for 9.1% of the total cutaneous manifestations. This is possible because majority of the paddy field workers were found to remain in touch with dried husk and grains, fertilizers, sewage water, and other chemicals which can act as potential cutaneous allergens and irritants. The use of nitrogen containing fertilizers release ammonia which in turn 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
The prevalence of disease with the association being statistically significant (P < 0.01). Hence, it could be inferred that greater the time spent daily on paddy fields, greater is the risk of acquiring skin diseases [Table 2].

Table 2: Association between various variables and the presence of skin diseases among paddy field workers (binary logistic regression)

| Variable                                      | Model 1 (not adjusted) | Model 2 (adjusted) |
|-----------------------------------------------|------------------------|--------------------|
| Duration of engagement in Paddy farming (years) | 0.21                   | 0.08               |
| Number of hours spent/day on paddy field      | 0.01                   | 0.02               |
| Use of farmyard manure/cow dung/fertilizers   | <0.001                 | <0.001             |
| Use of protective measures (footwear, gloves, masks) | <0.001                 | <0.001             |
| Time spent on work field/day/year             | 0.28                   | 0.28               |

*Results from binary logistic regression not adjusted for age and sex, *Results from binary logistic regression adjusted for age and sex. CI: Confidence interval

with ammonia. Moreover, the workers were also found to remain involved in wet work which apparently worsens hand eczemas. The prevalence of 9.1% seen in our study is higher than that seen in a study on Kashmiri population (6.9%) by Masood and Hassan.[8] This goes in favor of the role of occupation in causing and worsening hand and feet eczema in paddy field workers.

Hyperkeratosis of palms and soles was observed in 12.40%, while calllosities/cuts in 7.4% of all the skin lesions. In the present study, calllosities were mostly present on the palmar aspect of interphalangeal joints and metacarpophalangeal of both hands. This can be attributed to their practice of handling farm equipment (like spades, sickles) and the physical labor employed while plantation, weeding and harvesting activities. Small cuts may be caused either due to spiky nature of paddy leaves and also due to any thorn present in mud.

The daily working hours showed a positive association with the relative proportion of skin diseases observed, the association being statistically significant (P < 0.01). Hence, it could be inferred that greater the time spent daily on paddy fields, greater is the risk of acquiring skin diseases [Table 2].

Furthermore, the use of farmyard manure, cow dung, and fertilizers by workers had a positive association with the prevalence of disease with expectedly a higher proportion of disease being recorded in the workers using these irritants. The finding was statistically significant (P < 0.01), as depicted in Table 2. A study by Shiva and Singh also showed higher risk of dermatosis among paddy field workers who are exposed to animal manure.[9] This is further supported by the fact that most of farmers prefer to store cattle dung in stockpiles on farms for many months, which is eventually added to the soil 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, putting the field workers at high risk.[10]

The use of protective measures such as wearing footwear, gloves, and facial masks showed an indirect association with the prevalence of disease with the association being statistically significant (P < 0.001) [Table 2].

**Limitations**

Although the present study has helped us in forming an idea about the health problems in this occupational group, preventive strategies could not be addressed as they were beyond the scope of this study.

**Conclusion**

A large number of skin-related problems are encountered in paddy field workers, with non-infectious dermatoses being more than infectious ones. The findings of this study can be helpful in designing further studies for better understanding of the skin diseases associated with paddy farming and in devising preventive strategies to reduce the morbidity and work losses in this occupational group.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

Nil.

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