Profile of Dermatological Disorders Among Workers Involved in Fruit Growing Industry of Kashmir Valley in North India

Abstract

Introduction: Skin disorders represent a major proportion of occupational disorders. Dermatoses are becoming a source of concern in various population groups. In Kashmir valley, a large number of people are associated directly or indirectly with horticulture. Fruit cultivation is the main occupation of around 33 lakh people in the Union Territory. Aim: To study the profile of dermatological disorders in workers involved in fruit growing industry of Kashmir valley.

Materials and Methods: This study was a cross-sectional observational study, carried out over a period of 2 years, in which 701 workers of fruit growing industry of Kashmir valley were screened.

Results: 276 (39.37%) of these workers were found to have skin lesions while the rest, that is, 425 (60.63%) were not found to have any dermatoses. Out of the total dermatological lesions observed, occupational dermatoses contributed to 94 cases (34.05%), while non-occupational dermatoses accounted for 182 cases (65.94%). Among the occupational dermatoses, friction-related disorders (callosities and cuts) were predominant (15.9%) followed by allergic (12%) and irritant contact dermatitis (6.2%). Out of the non-occupational dermatoses group, the major portion was comprised by polymorphic light eruption (6.2%) in non-infectious type while in infectious type, onychomycoses predominated (3.3%). Conclusion: Dermatological conditions form a major group of occupational dermatoses among workers involved in fruit cultivation.

Keywords: Contact dermatitis, fruit growers, horticulture, occupational dermatoses

Introduction

Kashmir valley is famous for its awe-inspiring climate, beautiful snow clad peaks, landscape, meadows, and world famous tourist spots. The weather of the valley is suitable for the cultivation of a number of fruits. Kashmir valley is often known as the “fruit bowl” of Northern India. Horticulture in recent years has emerged as an important sector in the valley. The average estimated percentage contribution of horticulture and its allied sectors to state gross domestic product was about 21.89% for 2016–17 year (Economic survey 2015–16 J&K state). Kashmir is the main supplier of fresh and dry fruits in Indian subcontinent. Fresh fruits produced in Kashmir are apples, pears, cherries, strawberries, etc. The main dry fruits produced are walnuts and almonds.[1-3]

The most common occupational diseases reported worldwide are occupational dermatoses, accounting for 90% of the work-related cutaneous disorders.[4] It can be divided into irritant contact dermatitis and allergic contact dermatitis. In most cases, both types present as eczematous lesions on exposed parts of the body, mainly involving hands.[5] The people associated with growing/handling of fruits are involved in work like grafting, composting the soil, controlling weeds, pruning, tree topping, girdling, trimming of large trees etc. The repetitive use of the instruments involved in these activities can lead to conditions like callosities, and working with sharp instruments can lead to injuries etc., The workers are exposed to chemical agents like pesticides, fungicides, insecticides, fertilizers, etc., which can lead to contact dermatitis. Working in fields also exposes the workers to a number of photodermatoses. Such people are also exposed to a wide range of climatic conditions, from chilling temperature of winters (known as “chillaikallan” in local language), further predisposing to a number of dermatoses.
There is no study done till date in Kashmir valley to find out dermatoses in this group of population. The present study is an attempt to find out the profile of skin disorders in this population group.

Materials and Methods

In this study, workers involved with growing/handling of a particular fruit were examined after taking approval from the institutional ethical committee. The number of workers examined was as per the proportion of that fruit produced. Data regarding area under each fruit was obtained from department of horticulture. The main fruits grown in Kashmir valley include apple, pear, walnut, almond, cherry, strawberry, and grapes. The number of fruit growers of each kind to be interviewed was proportional to the area for the particular fruit cultivated (flow chart of study). Field visits were carried once a week during the study period except during the harvesting season when visits were taken two to three times a week. Demographic and clinical data including patient’s age, sex, number of years engaged in field work, average number of hours spent on fields per day, use of any protective measures (gloves, footwear, masks, etc.) during work, exposure to any irritant (pesticides, insecticides, fungicides, etc.) and type of skin lesion were noted and recorded on specially designed proformas. A verbal consent was obtained from each worker before questioning after reading out a preformed consent form in local language. Each participant was interviewed in local language. Dermoscopy if deemed necessary was done. Relevant laboratory investigations and specialized tests like KOH examination of skin scrapings and nail clippings, skin biopsy, and patch test were carried out in selected patients wherever deemed necessary. These investigations were carried out in the hospital as per the disease protocol and the patients followed up accordingly. The affected body parts of workers with skin afflictions were photographed for record and further diagnoses, after taking consent from each participant.

Inclusion criteria

Workers involved in fruit cultivation in different parts of Kashmir valley giving consent for participation in the study.

Exclusion criteria

1. The field workers not consenting for participation.
2. Non-local workers involved in fruit cultivation.

Results

The study included a total of 701 cases. Demographic profile of study population is given in Table 1. Out of the total 701 field workers, 526 (75%) were involved in using different irritants like pesticides, fertilizers, insecticides, farmyard manure, and fungicides during their daily work, while the rest 175 (25%) had no contact with any such irritant while working on the fields. In our study, only 287 workers (40.94%) used protective measures (like boots, gloves, and facial masks), while 414 (59.06%) workers working on the fields did not observe any such precautions.

Out of the total number of 701 fruit growers screened, 276 (39.4%) were found to have skin lesions while the rest, that is, 425 (60.6%) did not have any dermatoses. Out of the total dermatological lesions observed, occupational dermatoses contributed to 94 cases (34.05%) while non-occupational dermatoses accounted for 182 cases (65.94%). [Table 2]

| Fruit | District | Total area in hectare (% of total area) | Number of people |
|-------|----------|-----------------------------------------|-----------------|
| Apple | Baramullah, Shopian | 144825 (65.9) | 461 |
| Pear  | Budgam   | 6932 (3.1) | 22 |
| Walnut| Anantnag | 51021 (24) | 168 |
| Almond| Pulwama  | 6977 (3.1) | 26 |
| Cherry| Ganderbal | 2839 (1.3) | 22 |
| Grapes| Ganderbal | 228 (0.1) | 1 |
| Strawberry | Ganderbal, Baramullah | 174 (0.08) | 1 |

**Flow chart 1: Flow chart of study**

**Table 1: Demographic profile of study population**

| Variable                      | Value                    |
|-------------------------------|--------------------------|
| Sex distribution of study population | Males - 617 (88.2%) |
|                               | Females - 84 (12%)      |
|                               | M: F ratio - 7.3:1      |
| Mean age of the study group   | 16-76 years (39.4±12.58) |
| Duration of engagement in fruit farming | 1-30 years (11.1±7.8) |
| Daily working hours           | 3-12 h (6.71±1.64)      |
Among the occupational dermatoses, friction-related disorders (callosities and cuts) (15.9%) were predominant followed by allergic and irritant contact dermatitis. [Figures 1–4]. Among the cases of allergic contact dermatitis noted, hand eczema [Figure 3] was the most common dermatoses seen in 20 cases (60.6%), followed by hand-foot eczema - 8 cases (24.25%), leg eczema - 4 cases (12.12%), and eyelid eczema- 1 case (3.03%).

Out of the non-occupational dermatoses group, the major portion was comprised by polymorphic light eruption in non-infectious type while in infectious type, onychomycoses predominated (3.3%), followed by other fungal and bacterial, parasitic, viral and arthropod-borne infections.

Patch testing was done in 20 suspected cases of allergic contact dermatitis who presented as hand and foot eczema. The patch testing was done using Indian Standard Series of 20 antigens approved by CODFI (Contact and Occupational Dermatitis Forum of India). Out of these cases, positive patch test results were obtained in seven handlers for five allergens with a total of eight positive patch test reactions. The most common allergen identified was thiuram mix in three workers, followed by nickel sulphate in two workers, paraphenylenediamine fragrance mix, and nitrofurazone in 1 worker each [Figure 5].

While comparing the average number of years of engagement and the frequency of skin lesions observed, a positive correlation was observed with a $P$ value of $< 0.05$.

While correlating the use of protective measures like masks, gloves, and other protective measures by workers with the prevalence of disease, a lower prevalence of (28.6%) was seen in the workers using these measures while the non-users had a comparatively higher prevalence (46.9%). This finding was statistically significant with a $P$ value of $< 0.0001$.

| Skin Lesions                          | Frequency | Percentage |
|--------------------------------------|-----------|------------|
| Irritant contact dermatitis           | 17        | 6.2        |
| Friction related injuries (Callosities, Cuts) | 44        | 15.9       |
| Allergic contact dermatitis          | 33        | 12.0       |
| Melasma                              | 8         | 2.9        |
| Ephelides                            | 3         | 1.1        |
| Polymorphic light eruption            | 17        | 6.2        |
| Psoriasis                            | 6         | 2.2        |
| Chronic actinic dermatitis            | 5         | 1.8        |
| Androgenetic alopecia                | 14        | 5.1        |
| Seborrheic keratosis                 | 6         | 2.2        |
| Acne vulgaris                        | 8         | 2.9        |
| Lichen planus                        | 4         | 1.4        |
| Acrochordons                         | 4         | 1.4        |
| Lichen simplex chronicus             | 3         | 1.1        |
| Photoallergic contact dermatitis     | 7         | 2.5        |
| Diffuse hair loss                    | 11        | 4          |
| Alopecia areata                      | 5         | 1.8        |
| Bowens disease                       | 1         | 0.4        |
| Onycholysis                          | 4         | 1.4        |
| Topical steroid damaged face         | 5         | 1.8        |
| Milia                                | 5         | 1.8        |
| Onychomycosis                        | 9         | 3.3        |
| Pityriasis versicolor                | 8         | 2.9        |
| Scabies                              | 7         | 2.5        |
| Tinea corporis                       | 7         | 2.5        |
| Folliculitis                         | 6         | 2.2        |
| Verruca vulgaris                     | 5         | 1.8        |
| Intertrigo                           | 5         | 1.8        |
| Insect Bite                          | 5         | 1.8        |
| Paronychia                           | 4         | 1.4        |
| Pediculosis                          | 3         | 1.2        |
| Tinea Cruris                         | 4         | 1.4        |
| Total                                | 276       | 100        |
Similarly, while correlating the use of irritants like pesticides, fungicides, and insecticides with the prevalence of disease, a higher prevalence was seen in the workers using these irritants (48.5%), while those who did not use them had comparatively a lower prevalence of disease (39.1%). This finding was statistically significant with a $P$ value of 0.001.

**Discussion**

In this cross-sectional study, we found out that occupational dermatoses constitute a major proportion of skin disorders in workers involved in fruit cultivation. The high frequency of friction-related injuries observed could be attributed to several factors like ploughing, tilling the soil, picking, shoveling, hoeing, and raking. The use of clipper while cutting stalks on fruits after harvesting also leads to callosities of the hands. We observed such callosities mainly on base of fingers and base of thumb.

In a study done by Akhtar *et al.*[6] in cottage workers in Kashmir valley, 1,063 workers were screened and a total of 953 workers (89.7%) had cutaneous manifestations, with callosities being the most common finding seen in 371 workers (35%). The workers involved in this industry are also involved in handwork and use of instruments which leads to callosities.

In our study, we noted a high prevalence of contact dermatitis (both allergic and irritant). This percentage was more than double the frequency found by Masood Q and Hassan[7] in their study where they found it to be 6.9%. This goes in favor of the role of occupation in causing and worsening hand and feet eczema in field workers. Allergic contact dermatitis constituted 12% of total dermatoses and 34.05% of occupational dermatoses.

This high prevalence was attributed to a number of factors. The most important factor was use of various irritants like farmyard manure, insecticides (chloropyriphos, horticulture mineral oils), fungicides (captan, dodine, hexaconazole, mancozeb, ziram, zinzeb, etc.), weedicides, and pesticides. Moreover, the use of nitrogen containing fertilizers (which release ammonia) can cause severe skin irritation or burns.[8] This is supported by a study done in fruit and vegetable farmers of Himachal Pradesh by Ganshyam Verma *et al.*[9] and another study done by M. O’Malley and P. Rodriguez[10] in California nursery workers. Hyperpigmentation was noted in all the workers dealing with walnuts. This occurs due to presence of an allelopathic compound called juglone present in all green and growing parts of trees and in unripe walnut husks.[11,12] [Figure 6]

Among the non-occupational dermatoses, in infectious group, fungal infections were significantly higher among the workers and among the fungal infections, onychomycoses was the most common infection seen. This finding is supported by the findings of Blank *et al.*[13] and Shenoi *et al.*[14] who reported a high rate of nail infection among paddy field workers in India. Our finding is also supported by a study done by Spiewak *et al.*[15] The higher prevalence of fungal infections in this group of population can be attributed to multiple factors like working in hot and
humid conditions, use of rubber boots while working in fields and use of farmyard manure. Moreover, the workers associated with growing of dry fruits are involved in wet work like removing the kernels. The use of knives for removing kernels additionally causes abrasions/cuts, further predisposing them to fungal infections.

The higher occurrence of polymorphic light eruption seen in our study (7.8% of total skin lesions) could be attributed to the fact that workers have to work for long hours in intense solar radiation. The use of protective measures like wide brimmed hats and sunscreens is not prevalent in our population. Melasma was also noted at a frequency higher than that of general population (as compared to 1.8% reported by Masood Q and Hassan I)\(^7\) which can also be attributed to working for long hours in fields under the sun.

On analyzing patch test results, thiuram was found to be the most common allergen identified (37.5%). Current and old relevance was found in one reaction each. The positive patch test to thiuram mix in workers is attributed to two factors. Firstly, the fungicides used for spraying the plants contain tetramethylthiuram disulphide, a thiuram chemical. Secondly, thiurams are also a cause of rubber glove allergy as they are accelerators in vulcanization of rubber.\(^8\) We attributed positive allergic reaction to paraphenylenediamine to presence of this amine in footwear and rubber and increased prevalence of use of black rubber boots and gloves.
in this group of population. Allergy to nickel sulphate can be attributed to the use of locally made nickel plated handcarts which are used for carrying fruits from the site of packaging in fields to vehicles outside orchards. Even though positive patch test reaction to fragrance mix showed current relevance, but it was due to use of soaps, hand washes, and hand sanitizers, with little direct relevance to occupation being studied. In a similar manner, positive patch test reaction to nitrofurazone also has little direct relevance to occupation being studied.

Correlating the use of insecticides, fungicides, pesticides, farmyard manure, cow dung, and fertilizers by workers with the prevalence of disease, expectedly a higher proportion of disease was recorded in the workers using these (48.5%), while non-users had a comparatively lower prevalence of 29.1%. The finding was statistically significant (P-value < 0.0001). So contact with these substances is an important potential factor responsible for causing and worsening skin diseases in workers.

While correlating the use of protective measures like wearing footwear, gloves, and facial masks with the prevalence of disease, a higher prevalence seen in the workers not using these protective measures (46.9%) as compared to those using these measures (28.6%) with a statistically significant P value of < 0.0001. This clearly indicates the protective role of these objects in preventing skin diseases. This lower use of protective equipment could be attributed to financial constraint, lack of awareness, and non-availability of the proper protective equipment in the local market.

**Conclusion**

To conclude, skin disorders are commonly seen in fruit growers from our part of the globe. This has a multifactorial etiology, with various direct and indirect factors contributing to it. The relatively high incidence of skin diseases seen in our study as compared to the general population could largely be due to the use of irritants like pesticides, weedicides, fungicides, and fertilizers; the nature of manual labor, use of decomposed manure and exposure to intense sunlight. A proper pre-employment dermatological checkup, proper counseling about prevention of work place hazards, and periodic medical check-ups can alleviate such dermatoses in this occupational group.

**Limitations**

Lack of a control group is a limitation of our study which could have been used for better comparison and drawing more inferences.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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**Conflicts of interest**

There are no conflicts of interest.

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