Review Article

Occupational Dermatoses

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Abstract

Occupational skin diseases (OSDs) are one of the major problems in working life. Among occupational diseases, 30–45% are skin diseases. Contact dermatitis accounts for the greatest part (95%) of OSDs. It adversely affects the quality of life of workers. Classification of OSD is too difficult as there are geographical variations in the occupational groups affected. However, commonly affected occupational groups are agricultural workers, healthcare workers, construction workers, metal workers, cleaners, housekeepers, food handlers, hairdressers, beauticians, and mechanics. Because of the unorganized workplace, lack of a proper notification system for occupational dermatoses, and under-reporting of cases, there is a paucity of information regarding the magnitude of the problem of OSD in India. Although in India many studies have been conducted on individual small occupational groups, data on the complete epidemiology of OSD is limited. In this article, we have tried to compile the common OSDs in various occupations.

Keywords: *Occupational dermatoses, occupational skin diseases, OSD*

Introduction

Occupational skin disease (OSD) is described as any alteration in the skin, mucosa, and annexes, which is directly or indirectly caused, conditioned, maintained, or aggravated by agents present in the occupational activity or work environment.[1]

Today, OSDs are emerging concerns and constitute one of the major problems in working life, especially in developed and developing countries. Among the occupational diseases, 30–45% are skin diseases.[2] Contact dermatitis (CD) accounts for the greatest part (95%) of OSD.[3]

There are certain direct factors found in the work environment which include physical (heat, cold, and radiation), chemical (organic and inorganic chemicals), mechanical (pressure, friction, and vibration), and biological (bacteria, viruses, fungi, and parasites) agents. These factors may act directly on the skin and cause dermatoses or aggravate pre-existing dermatoses. Also, certain indirect factors predispose a person to OSD such as race, gender, age, pre-existing skin disorders like atopic dermatitis and environmental factors like temperature, humidity, etc.[4]

Recently, there is an interesting article by Bashir *et al.*[5] on OSD among paddy field workers. This study brings home the fact that occupational diseases need not be by occupation alone but also by environmental factors associated with the occupation such as increased incidence of melasma.

Epidemiologic characteristics of OSD

Knowing the prevalence of OSD allows monitoring of occupational dermatoses, and planning interventions aimed at reducing the risks of developing OSD. In European countries, following musculoskeletal disorders, OSDs are the second most common occupational disease.[6] The incidence of newly diagnosed OSD is reported to be 0.5 to 1 per 1000 workers annually in Europe.[7]

There is a paucity of information regarding the magnitude of the problem of OSD in India. Although in India many studies have been conducted on individual small occupational groups, data on the complete epidemiology of OSD is limited. This may be due to unorganized workplace, lack of a proper notification system for occupational dermatoses, under-reporting of cases because their association with the organization is not recognized, the difficulty of detection, and the mildness of the skin disease.

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Social and Economic Impact of OSD

OSD has a profound impact on quality of life.[8] It affects the lifestyle of the employees, compromises productivity, contributes to loss of working days, increases health expenditure among the working population and forces an employee to shift to other jobs.

It is also important in view of social as well as economic impact as these diseases are often chronic, need long-term treatment, and often lead to prolonged absence leading to financial stress. Moreover, it often affects young employees who are just starting their careers. Besides, the prognosis of severe OSD is poor, even after the patient stops working in that field and shifts to another job.[9]

Occupational Health Legislation in India

OSD is identified as one of the major occupational diseases in India.[10] There are 29 notifiable diseases as per the Indian Factories Act 1948, 3rd Schedule, Sections 89 and 90. Among those, the disorders of dermatologists' concern are CD, oil acne or dermatitis due to mineral oils, cancer of the skin, and chrome ulceration.[11]

In India, occupational health is under two ministries, that is, Labor ministry, and Health and Family Welfare ministry. Sixteen laws and two acts [the Factories Act (1948) and the Mines Act (1952)] are in force for the safety and protection of the health of workers in India.[12]

The national policy on safety, health, and environment at workplaces has been approved in 2009 by the Ministry of Labor and Employment, Government of India.[13] Though the legislation is in place for ensuring adequate occupational health and safety services, the major problem encountered is the ineffective implementation of legislation.

Factors Associated with an Increased Risk of OSD[9]

I. Wet condition: wet working conditions are defined as jobs in which employees routinely spend a considerable amount of time, that is, more than ¼th of each shift (or approximately 2 hours), with their hands in a moist environment or must wear waterproof gloves for the same amount of time or must wash their hands often or intensely (about 20 times)

II. Pre-existing skin diseases like atopic dermatitis

III. Environmental factors (high temperatures, low humidity, and sweating)

IV. Occupations involving considerable stress to the skin (highly problematic for patients with atopic eczema): hairdressers, florists, food handlers (bakers, pastry makers), massage therapists, metal polishers, cutters, painters, employees in photo laboratories, cleaning services, and hospitals, nursing care workers, and dental technicians.

Classification of OSD

Classification of OSD is a too difficult task as there are geographical variations in the occupational groups affected. However, commonly affected occupational groups are agricultural workers, healthcare workers, metal workers, construction workers, cleaners, housekeepers, food handlers, hairdressers, beauticians, and mechanics.[8] We have tried to compile the common OSDs in various occupations as below.

Agricultural Workers

Farmers and farm workers are exposed to numerous irritants and allergens, including water, chemicals, animal dander, flours, organic dust, infective agents, and sunlight which make their skin susceptible to develop various OSDs.

Paddy Field related OSD

Bashir *et al.*[5] studied the pattern of OSD in paddy field workers in the Kashmir Valley of India. They reported approximately 38.3% of workers with skin lesions. Out of the total skin lesions, infectious skin diseases were seen in 40.4%, while non-infectious accounted for 59.6% of cases. The main non-infectious skin disorders included were melasma, eczema of the hand and foot, hyperkeratosis of palms and soles, and callosities. Bacterial infections (most common: pitted keratolysis) followed by fungal (most common: intertrigo), viral, and parasitic were among the infectious OSDs.

Pesticides Related OSD

Pesticides are a heterogeneous group of chemical compounds that are used as insecticides, fungicides, herbicides, nematicides, rodenticides, and fumigants in agriculture, and horticulture across the world.[14]

Agriculture workers come in contact with pesticides in various ways such as the sowing of seeds preserved in pesticide, pesticide spraying, harvesting of pesticide sprayed crops, and exposure to water and soil contaminated with pesticides during cultivation.[15]

The commonly identified OSD due to pesticides are urticaria, discoloration of the skin, nails, and hair, chloracne, allergic contact dermatitis (ACD), irritant contact dermatitis (ICD), and porphyria cutanea tarda among exposed persons.[16] In India, pesticides commonly identified as causing CD are thiuram, dithiocarbamates, organophosphorus compounds, synthetic pyrethroids, 2,4-dichlorophenoxyacetic acid (2,4-D), captan, propargite, propiconazole, formaldehyde, mercaptobenzothiazole, cypermethrin, and isoproturon.[15] Another study from India by Verma *et al.*[17] found captan is the most common sensitizer, followed by propargite, chlorpyrifos, tree spray oil, and thiuram. Patch testing with pesticides is difficult. It is very difficult to obtain the pure chemicals. Commercially

available ones induce irritant reactions (personal communication of Prof. Dr. CR Srinivas).

Parthenium Dermatitis

Parthenium dermatitis is a very common occupational airborne contact dermatitis (ABCD) and the most common cause of plant dermatitis in India. It commonly affects farmers. *Parthenium hysterophorus*, a weed of the Compositae family, is abundantly found in India. The causative allergen, parthenin, is a sesquiterpene lactone. It may present as scaly itchy plaques on the exposed skin involving the folds as in ABCD or lichenified plaques over sun-exposed distribution or a mixed pattern, exfoliative dermatitis, and/or widespread dermatitis.[18]

OSD Related to Flower

Chrysanthemums, a genus of the Compositae family of plants, commonly cause CD. CD from *C. indicum* and *C. morifolium* has been reported in northern India. Flowers and leaves were found to be potent allergenic and stem being least allergenic.[19]

Fingertip eczema to crape jasmine (*Tabernaemontana divaricata*, family Apocynaceae), and yellow bell flower (*Tecoma stans*, family Bignoniaceae) have been reported in India where these flowers are part of routine pooja ritual at home, and sacred places.[20]

OSD Related to Cashew Nut Factory

Workers employed in the cashew nut industry are mainly involved in slicing off the outer hard shells from the nuts and peeling off the thin reddish covering on the nut.

According to a study by Pasricha *et al.*,[21] among the cashew nut workers in Karnataka, India, workers come in contact with the cashew nut shell oil while slicing off the outer shells which cause cauterization clinically presenting as brownish to black, thick sheets of dead skin on the palmar and dorsal aspects of hands [Figures 1 and 2]. Other dermatoses they detected were maceration of the hands, loss of the dermatoglyphics, pitted keratolysis, and pits on the finger tips [Figure 3], while no significant skin abnormality was detected in workers engaged in peeling off the thin reddish covering on the nut. Moreover, CD due to cashew nut shell oil has been confirmed by patch test with 0.1% cashew nut shell oil in polyethylene glycol.[22]

Automobile Service Industry

The automobile service industry is one of the largest industries in the world with a majority of the employees working in this unorganized sector of the industry. Automobile repair workers perform work such as spray painting, repairing, welding, cleaning, and servicing.[23]

The risk of OSD increases significantly among these workers with a lack of use of personal protective equipment (PPE), and repeated exposure to a wide range of chemicals,[24] like epoxy resins, adhesives, antifreeze and brake fluids, oils, gasoline, nickel, greases, colophony, solvents, detergents, etc.[25,26] OSD such as ICD, ACD, oil acne, skin infections, skin injuries, hyperkeratosis, and skin cancer are common.[27-29] Similar lesions are seen in foundry workers [Figures 4 and 5]. Cutting oil which acts both as lubricant and coolant is often the culprit.

Construction Industry

The construction industry is one of the fast-growing industries worldwide nowadays. This industry takes a

Figure 1: Keratotic plaques with irregular margins over the palms and palmar aspects of digits in a cashew nut worker

Figure 2: Dorsa of the digits showing brownish discoloration and thick plaques in a cashew nut worker

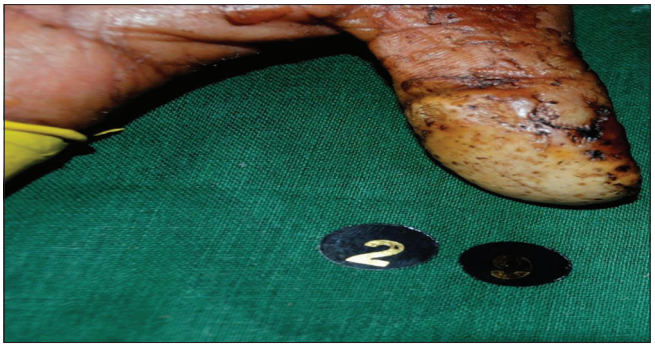

Figure 3: Numerous tiny, circular irregular pits present on fingertips in a cashew nut worker

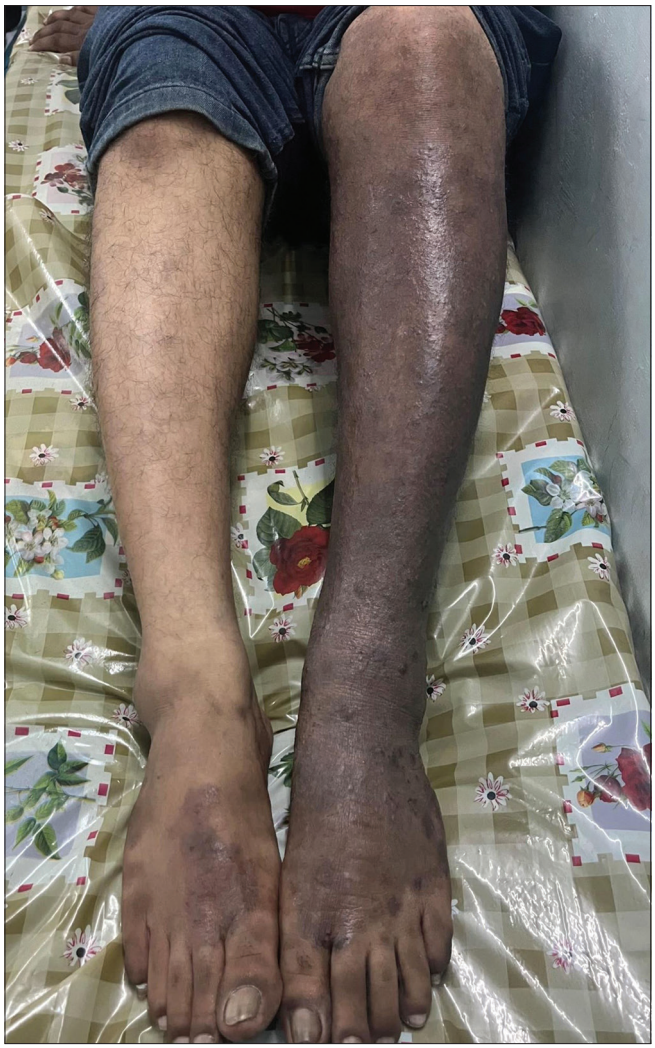

Figure 4: Hyperpigmentation and mild scaling over left leg and dorsum of foot in a worker exposed to cutting oil

major role in the construction of buildings, bridges, roads, dams, etc., Different kinds of activities, such as masonry, plumbing, painting, paving, welding, carpentry, electrical fixing, plastering, roofing, and others, are being done in this industry. Workers have to work with cement powder, concrete, glues, thinners, asphalt, gravel, and solvents which may cause dermatological disorders.[30] Also the workers work in summer, winter, and rainy seasons and are exposed to all types of weather conditions leading to skin diseases. According to a study conducted by Bhuiyan *et al.*,[31] out of all skin diseases, 28.15% were ICD and 9.24% were ACD. Other dermatological diseases detected were acne, skin injury, seborrheic dermatitis, burn, scald, scabies, fungal infection (dermatophytosis, pityriasis versicolor, and/or candidiasis), palmoplantar keratoderma, pyoderma, lichen simplex chronicus, photodermatitis, and urticaria. However, according to a study by Shah *et al.*,[32] the common skin disorders reported include callosities on palms (19.6%), dry, fissured, and scaly skin (10.9%), CD (4.3%), skin infections, tinea cruris, and ulcers on hands and/or soles.

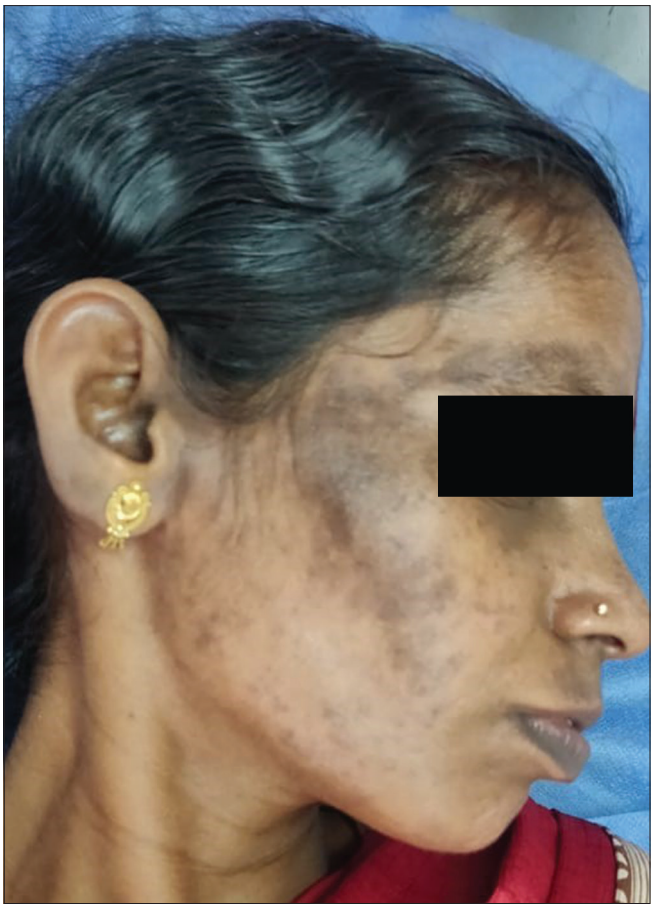

Figure 5: Diffuse follicular hyperpigmentation over the face of a woman working in a foundry

Commonly identified irritants at construction sites are cement, fly ash, chalk, chromate, hydrofluoric and hydrochloric acids, fiberglass, epoxy resin, cobalt, leather gloves, rubber, adhesives (phenol or urea-formaldehyde resins), wood preservatives, and polyurethane resins.[33] Cement is the most common cause of OSD. Soluble hexavalent chromium (chromate) is an allergen in cement to cause CD. Concrete is a mixture of portland cement (calcium, silica, iron, and alumina), aggregate, sand, and water. Wet concrete can cause both ICD and ACD.[34]

Plastic Industry

Plastic is one of the most widely used materials in everyday life. The plastic industry employs a large number of workers who are exposed to several chemicals and allergens with the potential to cause both ACD and ICD.[35]

In a plastic factory, many chemicals like plastic monomers and additives like stearic acid, waxes, alkylated phenols, fatty acid esters, amines, organic phosphites and phosphates, quaternary ammonium compounds, azodicarbonamide, modified azos, iron oxides, titanium dioxide, anthraquinones, methyl ethyl ketone peroxide, alkyl peroxide, benzoyl peroxide, phthalates, benzophenones, benzotriazole, and salicylates with a potential to cause OSD are being used.[35]

Moreover, the risk of developing the disease increases for employees who come in skin contact with formaldehyde or with polyvinylchlorides or their precursors.[36]

Leather Industry

Processing of leather is a multi-step procedure involving many chemicals. In the factory, workers are usually exposed to hazardous irritants and sensitizers like sodium chloride, metam sodium, 2-n-Octyl-4-isothiazolin-3-one, sodium dimethyl dithiocarbamate, lipase enzyme, sodium sulfide, lime, soda ash, and hydrogen peroxide. Workers work in hot and humid conditions in the factory for prolonged periods. The most frequently occurring OSD reported is CD, and other disorders include callosity, burn, paronychia, physical trauma, oil acne, and vitiligo.[37]

Rubber Industry

Multiple chemicals that cause CD in the rubber industry are benzothiazole, paraphenylenediamine compounds, ethylene thiourea, and resorcinol. Also, cutaneous squamous cell carcinoma has been detected in workers working in the rubber industry.[38] However, Srinivas *et al.*[39] did not find any dermatitis in rubber plantation workers exposed to latex for many years.

Electronics Industry

The electronics industry is of major importance in view of its great contribution to the economy and growth of the world. In the electronics industry of Singapore, 51.0% of workers were diagnosed to have ICD, 40.9% had ACD, and 8.1% were identified with noncontact dermatitis. Common irritants identified in the electronics industry are soldering solvents (alcohol, freon, and toluene), flux, oils and coolants, and fiber glass. The most common allergens are nickel and resins, rubber chemicals, and colophony.[40]

Electroplating Industry

Skin ulceration is the most common occupational dermatosis among chrome platers. Nineteen percentage (7 out of 37) of chrome workers were detected with chrome ulcers in a study by Lee *et al.*[41] Among the persons with chrome ulcers, only 14% (1 out of 7) were allergic to chromate.

Paint Industry

As reported by Bhatia *et al.*,[8] 7 painters out of 117 patients were found to have occupational CD. Eighty-five percentage of the painters were allergic to epoxy resin, potassium dichromate, glue, and colophony.

Furniture Industry

The prevalence of OSD among workers in the furniture industry was found to be 3.8% as per a study carried out in Singapore. The commonly encountered dermatoses reported in this industry are pruritus due to wood dust, ICD, xerosis, and miliaria. Known allergens capable of inducing dermatitis are catechols, quinones, saponins, etc.[42]

Recently, cases of severe CD related to new sofas and chairs due to potent contact sensitizer, dimethyl fumarate, have been reported in the U.K and Finland.[43]

OSD in Food Handlers

Persons working in restaurants and also homemakers are prone to develop skin diseases because of frequent hand washing in water, soaps, and detergents, contact with foods such as vegetables, citrus fruits, sugar, flour, spices, herbs, fish, sea foods, poultry, and meat, prolonged glove-wearing, and continuous mechanical insult while cutting vegetables.[44]

ICD is the most common skin disorder seen while the commonest irritant being wet work. Frequent hand washing >20 times per day and personal history of atopy endangers a person to develop ICD.[16] Burns are the commonest OSD along with ICD in the employees of restaurant and catering industry in Singapore as reported by Teo *et al.*[45] ICD is quite common among food handlers, bakers, and cooks but not among kitchen assistants or waitresses.[16]

Seafood is the commonest allergen in food handlers. Also, non-eczematous OSD such as paronychia, contact urticaria, and callosity is commonly seen in food handlers.[45] A frequently used tenderizer, papain which is a proteolytic enzyme, extracted from the latex of the papaya tree and fruit can cause ICD, ACD, and contact urticaria.[46]

A cross-sectional study was carried out by Latif *et al.*[47] on food handlers in Kashmir valley of India to find out the prevalence of ACD and allergens causing this using a patch test. Positive patch test results were confirmed in 27% of cases of food handlers. They identified nickel sulfate (10% cases) as the most common allergen which might be due to the use of nickel-containing utensils and the leaching out of nickel from those utensils while doing wet work. Also, positive patch test to allergens like p-phenylenediamine and cobalt chloride was identified in 6.8% of cases each. However, it should be remembered that all sensitization may not be linked to occupation.

OSD in Health Care Workers

A variety of persons, such as nurses, physicians, dentists, paramedical professionals, and cleaning staff, work in the healthcare sector. Healthcare workers (HCWs) are in danger of developing skin diseases due to many reasons like wearing of personal protective gear, most commonly rubber gloves, exposure to wet work, disinfectants, detergents, drugs, soaps, and specific dental materials like acrylates.[48] Because of their skin disease, approximately 61% of HCWs lose their working time.[49] ACD, ICD, and allergic contact urticaria (ACU) often develop among

HCWs.[48,50,51] Hand dermatitis is reported as one of the most commonly occurring OSD among hospital staff.[52]

In an Indian study, a patch test performed on HCWs showed positivity to rubber gloves (latex) in 50% of cases, followed by nickel in 40% of cases, cobalt chloride (15%), fragrance mix (15%), gentamicin (15%), and formaldehyde sensitivity in 12.5% cases. Other allergens causing ACD were neomycin sulfate, epoxy resin, thiuram mix, mercaptobenzothiazole, colophony, nitrofurazone, p-tert-butylphenol formaldehyde resin, polyethylene glycol 400, wood alcohol, and balsam of Peru.[53]

Dental technicians mostly suffer from ACD primarily due to methacrylates which are widely used in fillings, coating teeth, prosthetics, dental plates, and dentures.[54,55]

Nurse's cap alopecia is traction alopecia associated with the prolonged use of the nurse's cap and is seen in nurses. Clinically characterized by bilateral symmetrical, circumscribed loss of hair on the parieto-occipital area of the scalp where the cap is usually placed.[56]

During the COVID-19 pandemic, HCWs need to wear PPE. Most skin conditions seen in them throughout the pandemic were associated with the use of PPE like gloves, N95 masks, and goggles, frequent hand washing, and use of alcohol sanitizer.[57,58] ICD is the most common dermatoses seen due to frequent use of PPE during the COVID-19 pandemic.[59,60] ACD to hand washing soaps, alcohol-based cleansers, moisturizers, masks, rubber gloves, gowns, etc., has been reported. Seborrheic dermatitis, acne, and rosacea occur as a result of friction and sweating due to chronic mask wearing.[59]

An Indian study found ICD, pressure/frictional marks, sweat dermatitis, facial acne, ACD, and lip-lick dermatitis among HCWs.[61] Lip cheilitis and angular cheilitis have also been reported due to prolonged mask wearing and anxiety.[62] HCWs suffering from work absenteeism due to occupational dermatoses have also been reported.[61]

OSD in Veterinary Workers

The workers engaged in the veterinary profession interact with varieties of animal species in their working environments. Frequently, they are exposed to a wide range of skin allergens and irritants including animal fluids, disinfectants, agricultural dust, antimicrobial drugs, and chemotherapeutic agents like veterinary medicines, tranquilizers, etc., extreme temperatures, physical injury by animals, and infectious organisms that can produce dermatological disorders.[63]

The prevalence of OSD was found to be 29.3% among veterinarians and related workers in a cross-sectional study performed in Kashmir, India. Infectious skin lesions were seen in 38.2% of cases, while non-infectious disorders were seen in 61.8% of cases. The most common infectious lesions were fungal (21.7%) followed by bacterial, viral, and parasitic infections. Increased fungal infection might be due to exposure to potential fungal spore inoculums and high humidity inside animal farms. The main non-infectious lesions identified were callosity (8.6%) over the palmar aspect of interphalangeal joints of both hands which could be due to their practice of handling large animals, followed by ACD (7.1%), melasma (5.3%), androgenetic alopecia (4.9%).[64]

OSD in Beauticians and Hairdressers

Beauticians and hairdressers are mainly at risk of developing OSD because of wet work and exposure to various allergens such as paraphenylenediamine, preservatives, fragrances, nickel[65,66], acrylates, and methylisothiazolinone.[67,68] Also, they can develop contact urticaria while handling chemicals such as ammonium persulfate (bleaching agent), paraphenylenediamine (hair dye), glyceryl monothioglycolate (permanent wave agent), wheat protein hydrolysates, and *Lawsonia inermis* (henna).[69] The prevalence as well as the severity of hand eczema in hairdressing apprentices is quite higher than that in beauticians.[70]

OSD in Sanitary Workers

Sanitary workers are often exposed to infective organisms, dirt, sharp objects, chemicals, animal excreta, and gases like methane, hydrogen disulfide, carbon monoxide, and ammonia which subject them to develop skin disorders.[71,72]

Nayak *et al.*[71] in India reported fungal infections (34%) being the leading skin disorders among sanitation workers followed by CD (10%), xerosis (10%), melasma (7%), facial melanosis (7%), and others (scabies, fissured feet, pruritus, and polymorphic light eruptions).

OSD in Tea Plantation Workers

The frequent use of chemical pesticides in tea plantations and plucking the tea leaves with bare hands increases the risk of detrimental OSD. Skin itching, color changes in the fingers and palms, and ICD due to direct contact of chemical substances with the skin are commonly observed in these workers.[73] In addition, workers handling urea have a loss of dermatoglyphics (personal observation by Prof. Dr. CR Srinivas).

OSD in Coffee Plantation Workers

During the process of spraying pesticides on coffee plants, the workers are exposed to vast chemicals such as benzene hexachloride, bordeaux, and paraquat. Commonly observed dermatoses are periungual telangiectasia, erythema on photo-exposed areas, distal onycholysis, and splinter hemorrhages on nails as reported by Narahari *et al.*[74]

OSD in Photographers

Photographers are susceptible to acquire skin disorders such as CD (due to alkalis, acids, and p-phenylenediamine),

Table 1: Various occupations commonly causing skin diseases and the causative agents implicated in them

Occupation	Associated common skin diseases	Causative agents
Agricultural workers		
	Parthenium dermatitis	*Parthenium hysterophorus* (weed) - allergen is a sesquiterpene lactone called 'parthenin'
	Contact dermatitis due to pesticides	Thiuram, organophosphorus compounds, synthetic pyrethroids, dithiocarbamates, propargite, captan
	Eczema of the hand and foot, hyperkeratosis of palms and soles, nail dystrophy, paronychia	Mechanical friction, prolonged contact with water
	Cashew nut-related irritant contact dermatitis	Anacardic acid in fruit shells of *Anacardium occidentale*
Automobile industry	Allergic contact dermatitis, irritant contact dermatitis, oil acne, skin infections, callosities	Epoxy resins, cutting oil, colophony
Construction industry	ICD, ACD, callosities on palm	Cement, fly ash, chalk, chromate, hydrochloric acids, epoxy resin, fiberglass, leather gloves, rubber, adhesives, wood preservatives, cobalt
Plastic factory	ACD, ICD	Unsaturated polyester resin, stearic acid, waxes, alkylated phenols, benzoyl peroxide, methyl ethyl ketone peroxide, formaldehyde
Leather industry	Contact dermatitis, callosity, burn, paronychia, physical trauma	Sodium chloride, metam sodium, sodium sulfide, lime, soda ash, and hydrogen peroxide.
Rubber industry	Contact dermatitis	Benzothiazole, paraphenylenediamine compounds, ethylene thiourea, resorcinol
Electronics industry	Irritant contact dermatitis, allergic contact dermatitis	Alcohol, freon, toluene, flux, oils, coolants, fiberglass, nickel, resins, rubber chemicals, colophony
Electroplating industry	Allergic contact dermatitis, chrome ulcer	Chromate, nickel, gold chloride
Paint industry	Contact dermatitis	Epoxy resin, potassium dichromate, glue, colophony
Furniture industry	Contact dermatitis, xerosis, and miliaria	Wood dust, catechols, quinones
Food handlers	Irritant contact dermatitis, paronychia, contact urticaria, fingertip eczema, intertrigo, pitted keratolysis, callosities	Soap, detergents, constant use of water, onion, garlic, spices, seafood, continuous mechanical insult
Health-care workers	ACD, ICD, and allergic contact urticaria	Rubber gloves(latex), nickel, cobalt chloride, gentamycin, neomycin sulfate, fragrance mix, formaldehyde, epoxy resin, colophony, thiuram mix, paraben, woods alcohols, balsam of Peru, methacrylates
Veterinary workers	Skin infections, ACD, callosities	Animal fluids, disinfectants, agricultural dust, physical injury by animals
Hairdressers/beauticians	Allergic contact dermatitis, irritant contact dermatitis	Paraphenylene diamine, nickel, ammonium persulfate (bleaching agent), glyceryl monothioglycolate (permanent wave agent), shampoos, preservatives, fragrances.
Sanitation workers	Skin infections, facial melanosis, melasma, xerosis	Animal excreta, UV exposure, exposure to gases like methane, hydrogen disulfide, carbon monoxide and ammonia
Tea plantation workers	Skin itching, color changes in the fingers and palms, and ICD	Chemical pesticides
Coffee plantation workers	Periungual telangiectasia, distal onycholysis, splinter hemorrhages	Constant mechanical trauma, pesticides like benzene hexachloride, bordeaux, and paraquat
Textile industry	ACD	Azo dyes, naphthol
Instrumental musicians	Callosities, herpes labialis, skin injuries, ACD	Colophony, nickel, and exotic woods
Computer associated OSD	Mousing callus, ACD	Continuous friction, rubber
Coconut tree climbers	Callosities	Friction involved in gripping the tree while climbing

burns (due to contact with chromates, acids, and bases), leukodermas (due to hydroquinone), and lichen-planus or lichenoid eruptions (due to p-phenylenediamine).[75] In a cross-sectional study involving 100 photographers, 37% were found to have skin disorders comprising 24% CD, 3% nail hyperpigmentation, and 2% leukoderma.[76]

OSD in Textile Industry Workers

Occupational skin diseases cause significant morbidity in textile industry workers. Workers are involved in jobs like tying, dyeing, rinsing, and drying. Both ICD and ACD have been reported. Common allergens include textile dyes, textile finishes, chemicals, solvents, detergents, and rubber allergens.

Singhi *et al.*[77] studied 1300 workers (1000 engaged in cottage industries and 300 in textile industries) in western Rajasthan for skin diseases. They found skin lesions in 100 (7.69%) workers. The commonest skin disorders detected were itching (100%) followed by discoloration of the skin (40%), pain (38%), burning (30%), and nasal and conjunctival irritation (10%). The commonest allergens identified by patch test were azo dyes Red RC base (48%) and naphthol (29%).

OSD in Priests

Sandalwood (*Santalum album*) dermatitis has been reported in priests.[78]

OSD in Instrumental Musicians

During practicing and performing, there is contact between the instrument and the musician's skin. The most prevalent skin disorders include callosities, herpes labialis, skin injuries, and ACD to colophony, nickel, and exotic woods. "*Guitar nipple*", seen in guitar players, is described as inflamed cystic swelling at the base of the nipple developed due to the pressure of the edge of the sound-box against the nipple.[79]

Computer-Associated OSD

Computer-associated skin disorders have become more common because of the wide use of computers in different settings. Mousing callus is a painless, yellowish thickening of the skin on the palmar aspect of the wrist of the dominant hand which develops due to the continuous friction and pressure between the table and the wrist while using the computer mouse.[80] ACD caused by rubber mouse mat has also been reported.[81]

OSD in Coconut Climbers

Coconut climbers hold rope made up of coir and use their hands and feet for climbing. OSDs are mainly due to friction involved in gripping the tree while climbing. Balachandran *et al.*[82] found scaly lichenified plaque on the dorsal aspect of hands and feet, callosity over right thenar eminence and medial aspect of both fore feet, and pitted scarring of the extensor aspects of arm.

Various occupations commonly causing skin diseases and the causative agents implicated in them are described in Table 1.[5,14-82]

Diagnosis

Thorough and complete patient history is essential for the diagnosis of OSD. Special attention must be given to find out pre-existing skin diseases and atopic disorders (asthma, atopic dermatitis, and allergic rhinoconjunctivitis) of the patient. Clinical examination of the entire skin, hair, and nails is needed. Standard diagnostic procedures for confirming atopic status should be followed. Tests like skin prick testing with the most common inhaled allergens and patch test for identifying allergens of ACD should be advised.[9] Apart from that, examination of blood, urine, or tissue like skin, hair, and nails, laboratory tests for the detection of bacteria, fungi, and parasites, and skin biopsy for histopathological examination may be advised.

Management

Prevention[4]

Prevention comes before rehabilitation in any disease management. Prevention is the initial step in the management of OSD. Preventive measures to be followed include:

1. Pre-employment screening pertaining to any pre-existing skin condition that would increase the risk of OSD at the workplace.
2. Education and training regarding the identification of the irritants and allergens involved in work, potential risks associated with work, and symptoms and signs of unwanted effects.
3. Substitution of the particular agent or substance that is found as a cause of OSD.
4. Isolation of an agent or a process may be done to minimize times of exposure or the number of people exposed, thereby decreasing the risk of developing OSD.
5. Proper ventilation of the workplace reduces exposure to harmful airborne agents. There should be the provision of good ventilation systems to control dust, fumes, and vapors at the workplace.
6. Personal protection and protective clothing are necessary for all workers to avoid contact with harmful substances.
7. Personal hygiene in the form of rapid removal of chemical-soaked clothes, frequent changing of clothes, daily showering, proper washing of hands after work, and application of protective creams such as barrier cream, lotion, or ointment reduces the risk of OSD.

Treatment

Treatment of OSD should be approached individually. The most common OSD, CD, can be treated with wet dressing, topical corticosteroids, systemic corticosteroids, topical calcineurin inhibitors, or systemic immunomodulating drugs.

Conclusion

OSDs are persistent problems that adversely affect the quality of life of workers. Prevention programs to minimize workers' skin contact with noxious substances, health education to practice good personal hygiene, and safety measures are essential. OSD may be prevented through medical and legislative measures. The medical measures will help in the early detection and treatment of diseases while the legislative measures will ensure adequate delivery

of occupational health and safety services in the workplace. Above all, workers should be aware of their rights. These activities certainly result in a reduction in psychological and financial losses caused by absenteeism, treatment, and disability.

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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