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ABSTRACT

BACKGROUND: Occupational skin diseases are the second leading occupational disease, accounting for almost 25% of all missed workdays. Occupational contact dermatitis (OCD) accounts for 70% to 90% of all skin disorders in the workplace. Only a few occupational epidemiology studies have looked into the prevalence and risk factors of occupation-induced dermatitis among narcotic crop farm workers around the world. Related studies in Ethiopia are even fewer.

METHODS: A cross-sectional survey was conducted in the Dirashe district of Southern Ethiopia from March 23 to April 12, 2021. Data was collected using a standardized interviewer-administered questionnaire. The history of contact dermatitis was determined using the standardized Nordic Occupational Skin Questionnaire version 2002 (NOSQ-2002). A total of 578 farm laborers took part in the study, which was conducted using a systematic random sampling. Descriptive statistics and multivariable regression were used to characterize the data and identify factors associated with occupational contact dermatitis.

RESULT: The prevalence of self-reported occupational contact dermatitis in the past 12 months among workers of large-scale Khat farms was (AOR: 67.80%, 95% CI [61.00, 76.23]). In the multivariable regression, being older (AOR: 5.51, 95% CI [1.79, 7.24]), working as a bundle binder (AOR: 5.74, 95% CI [2.12, 15.55]), not wearing personal protective equipment (PPE) (AOR: 2.50, 95% CI [1.64, 3.81]), and having poor knowledge of pesticides use, storage, and disposal methods (AOR: 2.50, 95% CI [1.64, 3.81]) were associated with occupational contact dermatitis.

CONCLUSION: Contact dermatitis caused by work is very common among Khat farm laborers. Measures to promote safe practices and reduce exposure to hazards, such as removing expired and/or banned chemicals, purchasing alternative pesticides that meet legislative requirements, job rotation and routine training of staff on safe practices, increasing safety signage, and performing risk assessments, as well as improving the quantity and quality of institutional protective equipment supplies may thus contribute to the enhancement of safe work practices.

KEYWORDS: Occupational-related contact dermatitis, Khat farm workers, Ethiopia

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Introduction

Occupational health is concerned with the impact of work on worker health and well-being. It is critical in assisting employers in caring for and understanding the needs of their employees, allowing firms to minimize injury, illness, and employee turnover, as well as sick leaves, and increase performance and productivity.[1] However, because of competing social, economic, and political constraints, occupational health is still overlooked in many developing countries.[2]

In emerging nations, employees in the agricultural industry are under-protected compared to those in other industries, and they have a much higher rate of occupational diseases, accidents, and fatalities.[3] These workers endure unsafe work environments, pesticide exposure, long hours in hot weather, injuries from working with animals, and dangerous machinery.[4] Agricultural laborers are predisposed to occupational skin disease, among other health issues, as a result of their working environment.[5,6]

Ethiopia is a predominantly agricultural country. Land scarcity, deteriorating soil productivity, the marginalization of tried-and-true crops, and a lack of access to technologies influence the decisions of many producers. Thus, crops with a high financial yield frequently take centre stage. Khat (*Catha edulis* Forsk) is an example of such a crop.[7] Khat is a perennial evergreen shrub native to the Horn of Africa. The stimulants Cathinone and Cathine, which produce mild euphoria, are extracted from the bitter leaves and immature buds. Cathinone is illegal in most of Europe and Asia and is classified as a Schedule I narcotic in the United States, alongside heroin and cocaine.[8] Khat farming, as controversial as it is, is a lucrative business in Ethiopia. The country is the world's leading exporter of this amphetamine-like leaf.[9]

Khat production is part of the wide agro-silvi-pasture complex of Ethiopian rural landscapes.[8] From farm gates in rural areas to consumers in urban areas, the Khat trade follows a similar pattern.[10] In general, there are 5 nodes in the spatial flow of the Khat trade, namely farms, road junctions, village markets (collection hubs), central markets, and transport centres.[11] At each node, 2 types of sales occur: retail for local consumers located close to trading places and wholesale, to be transported to consumers elsewhere.[10-12]

Humans, horse carts, and tri-wheelers are the main modes of transportation from farms to road junctions. The Khat is then collected, trimmed, watered, and packed at trading junctures.[13] Small sellers provide goods and services such as food, soft drinks, tea/coffee, cigarettes, and plastic bags at each node. In addition, along the process, residual materials in the form of leaves and soft branches provide animal feed.[14] Hence, Khat-production activities provide employment and cash for several people, not just farmers.[15]

Nevertheless, there are serious health issues associated with Khat production. Workers' health is jeopardized by intensive farming with pesticides under highly controlled growing conditions.[16] Khat cultivators are increasingly employing pesticides to combat pests, insects, and diseases that have significant yield effects.[17] Some of the most common pesticides used by Khat growers include Malathion (diethyl(dimethoxythiophosphorylthio), Diatomaceous earth (silicon dioxide), Roundup (N(phosphonomethyl)glycine), DDT, Dacamine (2,4-Dichlorophenoxyacetic acid (2,4-D)), and Tricarnam (Carbaryl Propoxur).[6,16] Contact dermatitis, an irritating, inflammatory skin reaction to foreign materials, is one of the most prevalent occupational-related disorders among Khat farm workers, and because occupational dermatitis commonly affects the hands, low-wage employees may lose their ability to work and earn an income.[16,18]

Ethiopia is one of the nations that have adopted the International Labour Standards on Occupational Safety and Health (OSH) as part of their legislative framework.[19] In 2014, a national OSH policy was also prepared. However, despite the existence of favorable policies and regulations, their execution appears to be lacking.[20] Farm workers in Ethiopia are among the professions with the highest risk of work-related accidents and diseases.[21] They often lack awareness of their rights, as well as employment security. They also hold the lowest-paying positions with minimal opportunities for advancement. What's more, union activity is dispirited in most farms and many local organizations, are currently ill-equipped to engage in advocacy activities to support farm workers' health and labor rights; they lack organizational capacity and are poor in program planning and management.[22,23]

Workplace injuries and illnesses have far-reaching social and economic effects on families, businesses, and economies.[24] The concept of detecting vulnerabilities is central to the entire landscape of OSH.[25] With Khat as Ethiopia's fastest-growing export, production is unlikely to slow down anytime soon. As a result, ignoring the possible link between Khat farming and occupational dermatoses is becoming increasingly impossible.[26]

Globally, not many occupational epidemiologic studies have looked into the prevalence and risk factors of occupation-induced dermatitis among workers on narcotic crop farms.[27,28] In Ethiopia, there are fewer related studies.[16,29] Further OSH research into the factors associated with occupational dermatitis in Khat farms is needed to address this knowledge gap and make changes to protect worker health and wellbeing. In light of this, the purpose of this study is to determine the prevalence of and risk factors to occupation-induced contact dermatitis among workers of large-scale Khat (*Catha edulis* Forsk) farms of Southern Ethiopia.

Methods

Study area and setting

From March 23 to April 12, 2021, a community-based occupational contact dermatitis survey was conducted among the employees of large-scale Khat farms in the Dirashe district of Southern Ethiopia. The district is recognized for its enormous production of Khat. Dirashe is 606 km east of Addis Ababa, Ethiopia's capital city. There are 16 registered Khat cultivation enterprises in Dirashe. The worker demographics on the large-scale Khat farms were determined using an on-site census. In these farms, a total of 1645 laborers were employed in some capacity (permanent, contract, or day-laborer).

Source population

The source population consisted of all Khat farm laborers in Dirashe district's registered Khat farms.

Inclusion and exclusion criteria

Farm laborers that had spent at least 12 months on the Khat farms previous to the research period were included. Those in administrative, supportive, and not directly involved in the Khat growing and packing processes were excluded.

Sample size calculation and sampling procedure

The sample size was calculated using the single population formula. The total sample size was calculated to be 612 premised on a prevalence of 63% reported work-induced dermatoses in Khat farmers,[16] a margin of error (*d*) of 4%, a 95% confidence level of confidence, and a 10% non-response rate. Three hundred forty-seven farm laborers from the 16 large-scale farms were disqualified based on the eligibility criteria, giving a sample population to draw from 1298 employees. Each Khat farm was then given a proportional share of the calculated sample size based on the size of their operation. The study units were

then selected systematically from the workers' rosters at random beginning points until the calculated sample sizes in the respective farms were met.

Data collection tools and techniques

A structured interviewer-administered questionnaire was used to collect data. The standardized Nordic Occupational Skin Questionnaire version 2002 was used to determine the history of contact dermatitis (NOSQ-2002).[30] The generic job satisfaction scale questionnaire was used to assess perceived job satisfaction.[31] The job stress scale questionnaire was used to assess perceived job stress.[32] In the current study, a questionnaire adapted from previous occupation-induced dermatoses studies was used to assess the respondents' socio-demographic, personal, and behavioral characteristics, as well as work-related aspects (supporting information). The study team also included 4 professional occupational health and safety researchers and 1 experienced field supervisor, in addition to the principal investigator. The respondents were separated from their employers throughout data collection, and interviews were held in a private setting. Data on occupation-induced contact dermatitis was obtained for the previous 12 months.

Data quality control

A variety of methods were used to ensure data quality. The Nordic Occupational Skin Questionnaire (NOSQ-2002) was translated from English to Amharic (the lingua franca) by a health practitioner familiar with the terminologies; the forward translated version was then back-translated by an independent translator. For quality assurance, the translation strategy prioritized cross-cultural translations over the literal equivalence of the terms. In addition, the supervisor and data collectors received a 2-day intensive instruction on data gathering tools and methodologies. The questionnaire was then beta-tested at similar large-scale farms in the neighbouring district on 57 farm workers. The tool was finalized after the pre-test and necessary changes. The results of the pre-test were excluded from the main study.

Operational definitions

Work-related contact dermatitis. Non-communicable diseases caused by skin contact (allergic or irritant contact) with substances utilized at work, the case definition was redness, burning, blisters, itching, skin dryness, fissures, aches or pain, and scabs that have to develop on any part of the body in the past 12 months.[33]

Knowledge domain. This area is comprised of 12 questions about proper pesticide use and storage. Each question contains 3 or 4 possible responses. Knowledge scores were dichotomized by assigning a "1 point" score to each correct or expected response, while a "wrong," "unsure," or "unexpected" response received a "0" point. Each participant's total knowledge score was calculated. A person's aggregate knowledge score could be anywhere from 0 to 10. Finally, to compare findings with other studies, scores were divided into 2 categories: poor and good. Scores below the mean were considered poor, while scores equal to or above the mean were considered good.

Job satisfaction. A job-satisfied employee has a general job satisfaction scale score of 32 or higher.[31]

Job stress. An employee stressed out because of the job: A score of 21 or above on the workplace stress scale.[32]

Data management and analysis

Throughout the data collection procedure, the completeness of the data was reviewed regularly. Epi-Info 7 software was used to code, label, verify, categorize, and enter data. The data was analyzed using SPSS 20. For the first specific objective, determining the prevalence of occupation-induced dermatitis, frequency tables, percentages, and proportions with a 95% confidence interval were used to display descriptive findings.

To investigate the relationships between the independent and dependent variables, a bivariate logistic regression analysis was done. A *P*-value $<.20$ was used as a cut-off point to select the independent variables for multivariable analysis. Stratified analysis was performed for effect modification (based on age and service year). The stratum-specific measures of association were not significantly different. A forward variable selection strategy was used to enter variables into the multivariable logistic regression model. Hosmer and Lemeshow's test was used to check the model's fitness. In the multivariable analysis, variables with a *P*-value of less than .05 were considered statistically significant and reported by an Adjusted Odds Ratio (AOR) with a 95% confidence interval.

Result

A total of 578 farm laborers responded to the study (94.4% response rate). Despite efforts to raise awareness, interview refusals resulted in 5.6% non-participation. The majority of the study participants, 433 (74.9%) were male, with a male to female ratio of 3:1. The participants ranged in age from 16 to 65 years (median 28.8 years, SD $\pm$5.08). The majority of the study participants 311 (54.3%) were married. In terms of educational attainment, the majority of the respondents had only an elementary education 335 (58%), while 157 (23.7%) had no formal schooling. Five hundred three (87.0%) of the workers earned less than 1500 Ethiopian Birr (34.2 US dollars) each month, with 405 birr being the median. Three hundred eleven (53.8%) of the workers had less than 2 years of experience. The average length of service was 27.8 $\pm$ 5.6 months. The mean cumulative work experience in the Khat cultivation sector, on the other hand, was 32.8 $\pm$ 13 months (Table 1).

Table 1. Socio-demographic characteristics of study participants, Dirashe, Ethiopia, 2021.

CATEGORIES FOR VARIABLES	FREQUENCY	PERCENT OF THE STUDY POPULATION (%)
Age		
<17	35	6.0
18-36	398	68.8
37-54	105	18.2
>55	28	7.0
Sex		
Male	433	74.9
Female	145	25.1
Marital status		
Married	311	54.3
Single	250	37.2
Widowed	2	0.3
Divorced	16	1.8
Educational status		
No formal education	157	23.7
Primary education (1-8)	335	58.0
Secondary education (9-12)	72	12.5
Vocational education	10	1.7
Tertiary education	4	0.7
Monthly income		
<1500 birr	503	87.0
1500-3000 birr	45	7.7
>3000 birr	30	5.3
Service year in the current farm		
<24 months	311	53.8
25-37 months	100	17.3
38-50 months	87	15.0
>50 months	80	13.9
Total service year in the same profession		
<24 months	280	48.4
25-37 months	116	20.0
38-50 months	85	14.7
>50 months	97	16.9

Health behaviors of respondents

A total of 455 (78.8%) of the participants did not read material safety data sheets (MSDS) before using products. PPE was also brought up as a topic of inquiry. In response, 235 (40.6%) stated they wore some type of protective gear, but only 17 (14.4%) wore all of the essential gear. Respondents highlighted a lack of ready access to PPE 140 (29.7%), lack of comfort 104 (22.0%), lack of durability 93 (19.2%), and lack of fit 66 (13.9%), while 69 (13.7%) said they didn't need it to do their job safely. Furthermore, just 123 (21.2%) of respondents removed any contaminated clothing from their workplaces immediately, whereas 200 (34.6%) washed skin exposed to skin irritants or sensitizers daily. After pesticide spray, the average time to return to work/agricultural field was 6.1 hours. When dermatitis symptoms arose, 236 (40.8%) workers went to the doctor (Table 2).

Occupation and work environment-related characteristics of respondents

In this study, work patterns were divided into 3 categories: permanent, contractual, and day laborer. The majority of the study participants were contractual, 302 (52.2%). While 130 (22.6%) and 146 (25.2%) were permanent workers and day laborers, respectively. Respondents' occupation categories included field workers 298 (51.6%), bundle binders 156 (27.8%), pesticide applicators 92 (15.9%), and irrigation technicians 32 (5.6%). Ninety-seven (16.7%) of the respondents worked more than 48 hours each week; 219 (37.9%) of the study participants signed a contract of employment, 533 (92.3%) of study participants had never had any workplace safety training before starting this job, and 555 (96.0%) had no OSH specialist on-site.

In terms of water supply, 198 (34.2%) of the workers were employed in farms with non-functional water supplies. There were no handwashing stations provided for 146 (25.2%) of the employees. As to psychosocial characteristics, 243 (42.0%) of respondents experienced occupational stress, while 288 (49.8%) expressed dissatisfaction with their current occupation (Table 3).

Safe use of Pesticides knowledge, and perceptions

The farmers' awareness of pesticide safety is shown in Table 4. A large percentage of participants (25.4%) couldn't name the pesticides they used on their farms (either by trade name or local name). At least 1 adverse health impact induced by improper pesticide usage and storage was known to 416 (71.9%) of the farm employees. Three hundred (52.1%) of the participants were unaware of the meaning of the toxicity color codes found on pesticide containers. Three hundred thirty-nine (58.6%) of the study participants recognized skin absorption as a plausible route of pesticide exposure. Similarly,

Table 2. Health behavior-related characteristics of study participants, Dirashe, Ethiopia, 2021.

CATEGORIES FOR VARIABLES	FREQUENCY	PERCENT OF THE STUDY POPULATION (%)
A habit of reading material safety data sheets (MSDS)		
Yes	123	21.2
No	455	78.8
Use personal protective clothing (PPE)		
Yes	235	40.6
No	343	59.5
If yes, what type of PPE (n = 235)[b]		
Masks (locally prepared or factory made)[a]	76	32.3
Gloves[b]	65	27.6
Body wear	36	15.3
Head wear	21	8.8
Footwear	16	6.8
Eye wear	4	1.7
All	17	7.4
If no, reasons for not using PPE (n = 343)		
Lack of ready access/not provided	140	29.7
Lack of comfort	104	22.0
Lack of durability	93	19.7
Lack of fit	66	13.9
Does not need	69	13.7
Remove any contaminated clothing quickly (within 1 hour)		
Yes	123	21.2
No	455	78.8
Use barrier creams in areas not covered by PPE		
Yes	11	1.9
No	567	98.1
Wash skin that has been in contact with skin irritants or sensitizers		
Yes	200	34.6
No	378	65.4
Seek medical attention in case of contact with irritants or sensitizers		
Yes	236	40.8
No	342	59.2
Personal history of allergies		
Yes	146	25.3
No	432	74.7

[a]Bandannas, fabric masks, surgical masks.
[b]Cotton gloves, rubber gloves, coarse knitted blended fabric gloves.

Table 3. Occupation and work-environment related characteristics of study participants, Dirashe, Ethiopia, 2021.

CATEGORIES FOR VARIABLES	FREQUENCY	PERCENT OF THE STUDY POPULATION (%)
Job category		
Field worker	298	51.6
Bundle binder	156	26.9
Pesticide applicator	92	15.9
Irrigation technician	32	5.6
Employment pattern		
Permanent	130	22.6
Contractual	302	52.2
Daily laborer	146	25.2
Work hours per week		
⩽48 hours	481	83.2
>48 hours	97	16.7
Signed an employee contract		
Yes	219	37.9
No	359	62.1
Pre-employment safety training		
Yes	45	7.7
No	533	92.3
Occupational safety and health expert on-site		
Yes	23	3.9
No	555	96.0
Water supply in the farm		
No supply/not functional	198	34.2
Functional hand-pump	180	31.1
Functional piped water	200	34.7
Hand washing facility		
No facility	146	25.2
Facility with water	300	51.9
Facility with water and soap	132	22.9
Work cover insurance		
Yes	96	16.6
No	482	83.4
Job satisfaction		
Yes	288	49.8
No	290	50.2
Job stress		
Yes	243	42.0
No	335	58.0

more than half of the participants (60.8%) were unaware that pesticide residues may also pose a potential exposure route. Furthermore, 228 (39.5%) respondents failed to understand that some pesticides are banned in Ethiopia due to their harmful effects on humans, animals, and the environment (Table 4).

Prevalence of self-reported occupational contact dermatitis

In the previous 12 months, the overall prevalence of self-reported work-related contact dermatitis was 392 (67.8%) (95% CI [61, 76.2]). The hands were found to have the highest percentage of self-reported dermatitis complaints, at 192 (47.8%). The numbers for arms, face, and eyes were 13.8%, 22.3%, and 4.9%, respectively. Multiple sites of contact dermatitis were reported by 31.4% of participants (n = 123). Redness was the most common self-reported contact dermatitis symptom 138 (27.7%), followed by burning 123 (24.7%) (Figure 1)

Factors associated with occupation induced dermatitis

Being older, working as a bundle binder, having inadequate knowledge of pesticide use and storage, and not wearing personal protective apparel were associated with occupational contact dermatitis in the multivariable regression (Table 5).

Workers over the age of 55 were 5.51 times more likely than their younger colleagues to develop occupational contact dermatitis (AOR: 5.51, 95% CI [1.79, 7.24]). Working as a bundle binder increased the risk of contact dermatitis by 5.74 times compared to other departments (AOR: 5.74, 95% CI [2.12, 15.55]). Farm laborers who did not utilize PPE had a 2.5-fold higher risk of occupational dermatitis (AOR: 2.50, 95% CI [1.64, 3.81]). Knowledge of safe pesticide handling was linked to occupational contact dermatitis. Farm workers who did not know how to use and dispose of pesticides properly were 2.5 times more likely to develop contact dermatitis (AOR: 2.53, 95% CI [1.64, 3.81]) (Table 5).

Discussion

Agriculture is critical to both the economy and consumer health, and the health and productivity of farm workers have a ripple effect that impacts everyone. In this study, the period prevalence of self-reported occupational contact dermatitis among workers of large-scale Khat farms was 67.8% (95% CI [61.0, 76.2]). Despite the widespread use and production of Khat, there is little peer-reviewed literature on occupational dermatoses, and the potential causes thereof, among Khat farmers. In a similar study in the country's east, 63% of Khat farm workers suffered from work-related dermatitis, reportedly associated with risk factors such as working period, work hours, educational status.[16]

Table 4. Safe pesticide use, storage, and disposal knowledge among narcotic farm workers, Dirashe, Ethiopia, 2021.

CATEGORIES FOR VARIABLES	FREQUENCY	PERCENT OF THE STUDY POPULATION (%)
Know the names of pesticides used in farms (might also be the trade name or local name)		
Yes	426	73.7
No	147	25.4
No need to	5	0.9
There are adverse health effects of pesticides on humans		
Yes	416	71.9
No	144	25.0
Don't know	18	3.1
Aware of the toxicity colour codes present on the pesticide containers		
Know all	181	31.3
Know some	97	16.7
Know none	300	52.1
Pesticides can enter through dermal contact		
Yes	339	58.6
No	190	32.9
I don't know	49	8.5
Pesticides can enter the body through the respiratory system		
Yes	316	54.6
No	210	36.3
I don't know	52	9.1
Pesticides can enter through the mouth into the body		
Yes	400	69.2
No	120	20.7
I don't know	58	10.1
Pesticide residues may be detected in the leaves of sprayed tress		
Yes	352	60.8
No	148	25.6
I don't know	78	13.6
Is there any expiry date on pesticide containers?		
Yes	323	55.8
No	243	42.0
I don't know	12	2.2

(Continued)

Table 4. (Continued)

CATEGORIES FOR VARIABLES	FREQUENCY	PERCENT OF THE STUDY POPULATION (%)
Can't use pesticides if you can't identify the contents of the container, or if you can't tell how old the contents		
Agree	315	54.4
Disagree	163	28.2
I don't know	100	17.3
The fate of pesticides can be in groundwater or surface water		
Yes	356	61.7
No	123	21.2
I don't know	99	17.1
We can reuse a pesticide container for any purpose		
Never	364	63.0
Some times	100	17.3
Always	114	19.7
Particular pesticides cannot be legally used in Ethiopia		
Yes	350	60.5
No	228	39.5
Knowledge of pesticide use and storage		
Yes	501	86.3
No	77	13.7

The prevalence of occupational contact dermatitis in this study was further compared with studies conducted among other types of farm work. This study's outcome was lower than the 69.7% obtained from Nigerian farm laborers. At the same time, it was higher than contact dermatitis prevalence rates among fruit growers in Poland (55.0%),[34] Belize (36.7%),[35] and Taiwan (30.0%),[36] as well as horticulture farm workers in Tanzania (57.0%)[37] and Ethiopia (52.1%).[38] The differences in prevalence rates found in these studies could be due to variations in the kind of activities carried out at the different farm sites. It could also be related to disparities in socio-cultural, economic, health, and health-care utilization characteristics among respondents, as well as methodological variances between studies. Because of limited health insurance coverage, high medical costs, and the fear of losing one's job, many cases of work-related illnesses go untreated in developing countries.[39]

Contact dermatitis was linked to the number of hours worked per week, not wearing gloves, male gender, educational position, and poor housing circumstances in other types of farm work.[34-38] In the present study, workers over the age of 55 were more likely to have occupational dermatitis than those who were younger. One of the most significant challenges in worldwide skin health has been age-related skin disorders. Aging, whether alone or in combination with environmental and lifestyle factors, diminishes functional capability and increases skin vulnerability to dermatitis.[40] In this study, farm laborers wore little to no sun protection and used inadequate protective gear. Exposure to irritants, allergens, or other skin-damaging chemicals is unavoidable in farm work.[34,36,37] Cross-tabulations revealed that bundle binding is the predominant job category among this age group, signifying that there may be an increased risk of pesticide contact and plant-related allergies. Thus, measures aimed at promoting safe practices and reducing exposure to hazards may thus contribute to the enhancement of safe work practices.

The skin works as a protective barrier against injury, bacteria, viruses, and chemical irritants.[41] Certain occupations, on the other hand, can damage the epithelial barrier, leading to the development of skin disease.[42] In the current study, workers who served as Khat bundle binders were more likely to develop contact dermatitis than those who did not. This could be explained by the reality in many underdeveloped countries, where most employees rely on manual packing and binding of crops due to a lack of access to machinery or personal protective equipment.[43] According to studies, workers who manually package agricultural products are more exposed to pesticides and plant allergens.[44,45] Although contact dermatitis from pesticides has been recorded,[6,45] phytodermatitis from narcotic crops is largely unknown. While recent research has linked repetitive cannabis handling to contact dermatitis.[46] Owing to its illegal status in many regions of the world, hypersensitivity reactions to Khat are rarely recorded in literature.

PPE was also a significant factor affecting occupational dermatitis in this study. Contact dermatitis was more likely among Khat farm workers who didn't use PPE. In any workplace, successful task performance necessitates the supply of adequate infrastructure, as well as appropriate equipment and supplies.[47] The scarcity of PPE on farms is a key organizational obstacle to workplace safety.[48] Its absence not only has an impact on the quantity and quality of work but also puts farm workers' lives and livelihoods in jeopardy.[47]

For employees to work effectively, they should be equipped with appropriate quality PPE.[49] These include devices that reduce physiologic burdens, protect against major injuries or illnesses caused by chemicals, radiation, physical, electrical, mechanical, or other risks, improve communication, and make donning more pleasant and less of a strain.[50] Managers should select equipment that is appropriate for the user, taking into account the size, fit, and weight of the PPE.[51] Employees are more inclined to use something if they helped choose it.[52]

Employers should also teach and train their employees on how to use PPE properly. Explain why it is required, when it should be used, and what its limitations are.[53] Workers'

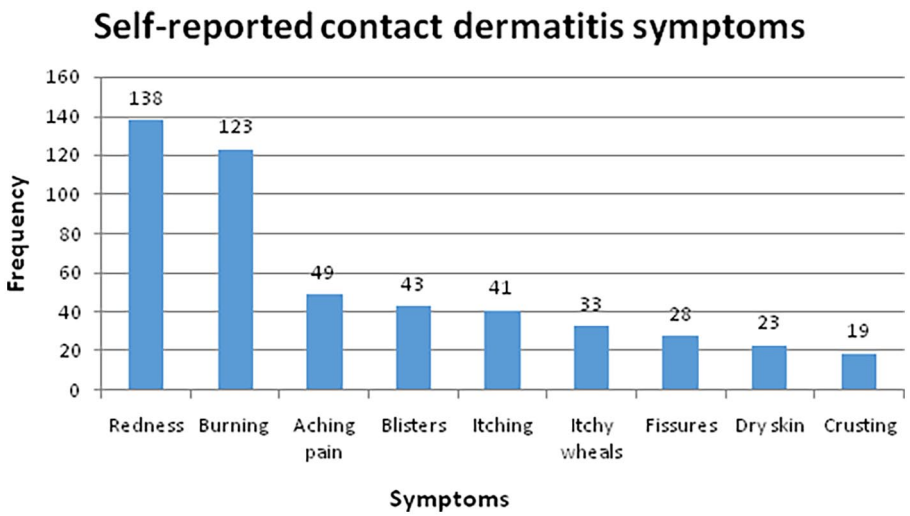

Figure 1. Symptoms of contact dermatitis among narcotic farm workers of Dirashe district of Southern Ethiopia, 2021 (n = 392).

devotion to PPE will be questioned if this does not happen.[54] Lack of comfort, fit, and durability were reported as reasons for employees not wearing PPE in this study. This finding is consistent with findings from Tanzanian and Cameroonian investigations.[55,56] Poor quality PPE were found to have an impact on the use of safety measures in these studies.

Improper pesticide handling, application, and storage can endanger humans, animals, and ecosystems.[55] In any workplace, employer and employee education on health hazards and their control is essential and must be based on scientific evidence.[57] Workers' knowledge and awareness of the risks connected with workplace conditions are likely to rise as a result of OSH training, as this generally improves early recognition and notification of the symptoms.[58] If this is not done, occupational diseases, accidents, and fatalities may occur. In this study, farm workers who had poor knowledge of proper pesticide use, storage, and disposal methods were at greater risk of developing contact dermatitis than those who had good knowledge. Although there is limited research linking occupational contact dermatitis and Khat farm workers' knowledge of proper pesticide use.[6,16] Several studies have corroborated this in other types of farm work.[54-56]

There are certain limitations to this study. In self-reported research, there is a risk of recall bias. Furthermore, social desirability may skew participant responses, causing them to produce sociably favored answers. However, measures were taken to limit social desirability by ensuring that only study participants were present during data collection and that data confidentiality was maintained. The data on personal protective equipment reported in this study is almost entirely dependent on the participants' perceptions, rather than hard evidence, such as tests of effectiveness, durability, and fit of protective clothing. The reported results have not been independently verified. Though perceptions are important, they can be skewed by emotions and vested interests, and hence may fail to correctly reflect actual realities. Furthermore, because this was a cross-sectional study, a healthy worker effect should be expected, as workers with severe contact dermatitis are unlikely to stay in this line of work.

Conclusion

In this study, 392 (67.8%) of farm workers reported occupational contact dermatitis as a result of working in large-scale Khat farms. Occupational contact dermatitis was associated with older workers (>55 years), working as a bundle binder, insufficient knowledge of pesticide use and storage, and not wearing PPE. Measures aimed at promoting safety practices and reducing exposure to hazards, such as the removal of expired and/or banned chemicals, the purchase of alternative pesticides that meet legislative requirements, job rotation and routine training of staff on safety practices, increasing safety signage, and performing risk assessments, as well as improving the quantity and quality of institutional PPE supplies may thus contribute to the enhancement of safe work practices. More importantly, establishing an Environmental Health and Safety Office (EHSO) to assess potential exposures is vital to inform employers on the controls required to provide proper protection.

Future research should look into the differences in the risk of occupational dermatitis between different work patterns, as well as the implications for contaminated clothing and the effects on those who launder it. In addition, workers in the administrative and supportive units should be included in future surveys as a control group. Longitudinal studies on the use of agrichemicals (pesticides, herbicides, fertilizers, and so on) are also needed to generate more scientific evidence on the effects of agrichemicals and other occupational irritants and allergens on Khat farm workers, as well as the impact of potential control strategies on worker health.

Table 5. Multivariable logistic regression of factors associated with occupation-induced contact dermatitis among narcotic farm workers in Dirashe, Southern Ethiopia, 2021.

CHARACTERISTICS	OCCUPATIONAL DERMATITIS		COR (95% CI)	AOR (95% CI)	*P*-VALUE
	YES	NO			
Age					
<17	29 (82.86)	6 (17.14)	1	1	
18-36	273 (68.59)	125 (31.41)	2.21 (090, 5.47)	1.74(0.67, 4.51)	.933
37-54	71 (67.62)	34 (32.38)	2.32 (0.88, 6.10)	2.32(0.82, 6.57)	.217
>55	17 (60.71)	11 (39.29)	5.34 (1.82, 15.67)[b]	5.51 (1.76, 17.24)	.011**
Job category					
Field worker	213 (71.48)	85 (29.71)	1.28 (0.46, 3.53)	1.78 (0.57, 5.54)	.217
Bundle binder	85 (51.92)	71 (48.08)	2.91 (1.01, 8.41)[b]	5.74 (2.12, 15.55)	.041*
Pesticide applicator	68 (73.91)	24 (26.09)	0.86 (0.28, 2.59)	1.06 (0.31, 3.60)	.648
Irrigation technician	26 (81.25)	6 (18.75)	1	1	
Employment pattern					
Permanent	75 (57.69)	55 (42.31)	3.28 (1.69, 6.36)[a]	1.76 (0.80, 3.89)	.073
Contractual	205 (67.88)	97 (32.12)	1.73 (0.99, 3.01)	0.89 (0.39, 2.03)	.091
Daily laborer	112 (76.71)	34 (23.29)	1	1	
Work hours per week					
⩽48 hours	335 (69.65)	146 (30.35)	1	1	
>48 hours	57 (58.76)	40 (41.24)	1.61 (1.03, 2.52)[a]	1.30 (0.80, 2.12)	.121
Use personal protective clothing					
Yes	186 (79.15)	49 (20.85)	1	1	
No	206 (60.06)	137 (39.94)	2.50 (1.64, 3.81)[b]	2.50 (1.64, 3.81)[b]	.026*
Pre-employment safety training					
Yes	368 (69.04)	165 (30.96)	1	1	
No	24 (53.33)	21 (46.67)	1.95 (1.06, 3.61)[a]	1.86 (0.95, 3.64)	.344
Knowledge of pesticide use and storage					
Yes	339 (67.66)	162 (32.34)	1	1	
No	40 (51.90)	37 (48.10)	1.93 (1.22, 3.31)[b]	2.53 (1.66, 3.83)[b]	.009**

[a]Significant in the bivariate analysis.
[b]Significant in the multivariable analysis.
*$P \leqslant .05$. **$P \leqslant .01$.

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Author Contributions

AT was involved in the conceptualization and investigation, study design, overall supervision, analysis, writing, and approval of the final manuscript.

Availability of Data and Materials

All the data supporting the findings are included in this paper.

Ethics Approval and Consent to Participate

The author confirms that all methods used in this study were carried out in conformity with all relevant guidelines and regulations (Declaration of Helsinki). Wachemo University's Ethical Review Committee provided ethical clearance and permission. The Dirashe district's Health Bureau provided the necessary support letter. All participants were given full disclosure of the

study's purpose and were informed of their right to refuse to participate or stop the interview. Furthermore, all information gathered for the study was kept private and secure. All workers who took part in the study received health education and OHS training. Training was administered at the worksite. The findings of the study were also sent to the farms under study, the district trade and investment bureau, the district health office, and Wachemo University's College of Health and Medical Science.

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