Original article

Occupational induced health problems in floriculture workers in Sebeta and surrounding areas, West Shewa, Oromia, Ethiopia

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Abstract

Background: Floriculture is a booming sector in Ethiopia; nevertheless, there are certain concerns regarding the health status of the workers. To address this issue, an effort has been made to outline the outstanding health problems that have manifested in some of the floriculture farms in the designated area of the study.

Objectives: To assess health problems encountered in the farms, and their determinants among floriculture workers in Sebeta and surroundings.

Methods: A Cross-sectional study design, using qualitative and quantitative methods, was conducted among floriculture workers in Sebeta Town and surrounding areas from December 01, 2010 to February 30, 2011. A sample of 612 workers was selected using systematic random sampling techniques. Data were collected through pre-tested structured questionnaire, in-depth interviews and working environmental observation. Then, data were entered using EPI Info. Analysis was done using SPSS version 16 statistical program.

Results: The majority, 433 (74.9%) of the workers were females, with 539 (93%) of study subjects showing at least one health symptom in the last 12 months prior to the study period, 392 (67.8%) had at least one skin problem and 81.1% had at least one respiratory health symptom in the last 12 months. The highly prevalent disease symptoms were fatigue 422 (76.5%), followed by head ache 424 (73.4%) and sleepiness 367 (63.5%). A *3.16 (95%: CI 1.28-7.80)* odds of having symptoms of disease was observed after adjusting for confounders among those who did not have full personal protective equipment. There was also *4.93 (95% CI 1.44-16.91)* times odds of symptoms of disease amongst workers who did not use personal protective equipment properly, and odds of reported symptoms of disease were *2.75 (95% CI 1.15- 6.61)* higher for those who did not take pre-employment safety training.

Conclusion: Prevention interventions were generally neglected, with only 345 (59.3%) employees reporting having and 214 (62.39%) properly using personal protective devices. In view of that, adequate supply of personal protective equipment, pre-employment safety training and use of good management of chemicals applied in the farm are highly recommended. [*Ethiop. J. Health Dev.* 2013;27(1):64-71]

Introduction

Occupational health is about the effect of work on health. It plays a vital role in helping employers care for and understand the need of their employees to reduce sickness and optimize staff performance and productivity (1). Occupational health remains neglected in developing countries because of competing social, economic, and political challenges (2).

Agriculture is one of the most hazardous sectors in both developing and industrialized countries. Compared to workers of other sectors, agricultural workers are under protected and suffer markedly higher rates of accidents and fatal injuries than workers found in other industries (4). The most vulnerable groups are daily laborers in plantations, seasonal workers and temporary workers.

Since floriculture workers are exposed at numerous stages of plant growth, worker exposure is of particular concern in greenhouses, where up to 127 different chemicals are used in enclosed spaces, which increases the risk of exposure through the skin and by inhaling (4). Health problems are associated with all phases of handling of pesticides, but most cases poisoning occur in workers applying these agents (5).

The occupational pesticide exposure of floriculture workers is intense and acute in closed plastic greenhouses without ventilation. The risk is even higher when they do not use special work clothes in their activities in the greenhouses, and they wear their pesticide impregnated clothes outside of work. The wide spread use of pesticides and the long and persistent exposure of floriculture workers to these are of major public health concern (6). In most countries, the incidence of serious health effects could be low, with a high incidence of minor signs and symptoms reported in a few countries, especially in Africa (7).

Study on occupational health effects among workers in floriculture is useful in the development of pertinent preventive and control strategies. This study is helps to identify possible health effects and provide the statistical evidence regarding the magnitude of the problem and is to serve as base line information for subsequent comparative and longitudinal studies. Since it is on an

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expansion and becoming one of the country's economic sector, information on occupational health and safety services specifically in the floriculture industries is helpful to raise awareness at all levels. Therefore this study was designed to assess occupation induced symptoms of diseases in the floriculture industry to give insight about health problems, their magnitude and related factors.

Methods

Study Area and Population:
The study was conducted in Sebeta Town and surrounding areas from December 01, 2010 to March 30, 2011. Sebeta is 25 Km far from Addis Ababa in the West. Data from the Sebeta Investment Office indicated that, there were 17 registered floriculture industries having a total of about 2000 employees.

Study design:
A Cross-sectional study employing both quantitative and qualitative methods was used to assess the health problems encountered in the farms.

Inclusion criteria: Farms that had been functional for 12 months prior to the study, and workers, who worked at least for 12 months in the farm, were eligible for the study. That was on the assumption that workers at that contact level were exposed work related hazards. Farms that did not fulfill the criteria and workers with lower exposure were excluded.

Sample size estimation: To determine the sample size, the formula for single population proportion was used. Based on the reported causes and types of health effects (7) during the uses of crop protection chemicals in cut-flower industry, the prevalence of 63% of health problems among agriculture workers was used. With 4% degree of precision, considering 10% non-response rate, the total sample came to about 612.

Sampling methods: Based on the inclusion criteria, among the 17 floriculture farms nine were selected; giving a total sample size of 612, which was allocated proportionally with respect to the number of each farm's staff. The study units were selected again in line with the inclusion criteria systematically using random starting point from the workers roster to get individual study participants from the perspective farms.

Data Collection:
A pre-tested structured questionnaire was used, including questions adopted from similar studies (19) to capture relevant data. Further, a check list for the observation of working environment was used (20). The questionnaire was administered by six first year MPH students who were trained for one and half days before starting data collection and two MPH supervisors were involved. Questionnaires were pre-tested on about 5% of the study subjects on farms which were not selected, to identify potential problem areas, unanticipated interpretation and cultural objections to any of the questions and the necessary adjustment were made.

Data Processing and Analysis:
Data were entered by EPI Info version 3.5.1 then exported to SPSS version 16 statistical program for cleaning and analysis. About 10% of data were double entered to check consistency. Frequency count and percentage were used to clean and check the accuracy of data entry. Similarly, frequency distribution, percentage, tables and charts were used to present results of univariate analysis. Data were analyzed to determine the overall prevalence of health symptoms. Data on educational status, total service year, age, sex and exposure status (experience), job category, use of PPE and proper usage and safety training were examined for association. Cross tabulation, and odds ratio (OR) using 95% confidence interval (95% CI) were done on SPSS version 16.0 statistical programs. First bivariate analysis was done by a logistic regression model; then variables, which showed statistically significant associations, were used as covariates to see the relative effects of independent variables on dependent variable by controlling for potential confounders. A statistical test for significance was carried out at 5% level of significance and 95% confidence levels.

Data quality management: One and half day's training on data collection procedures, how to keep the quality, its completeness and timely recording was given. Pre-testing of the questionnaire was done to assure the quality for improvement of the data collection tool. Then some modification of the tool was done. Irrelevant questions were removed. Some questions were rewritten again to make them clear. Supervision during data collection was done to understand how the data collectors were handling the questionnaire and each filled questionnaire was checked for its completeness, accuracy, clarity, consistency on a daily basis. Corrective measures were given accordingly if there was any gap, then a special care was given during data entry, and cleaning and the whole data were cross checked for reliability before analysis.

Ethical Considerations:
There were no invasive procedures entertained in this particular study. Cases were advised to visit the nearby health services regarding health problems they encounter. Ethical clearance was obtained from the Research and Publication Committee, School of Public Health, Addis Ababa University. Official letters were written by the school of public health to the farms. The purpose of the study was explained to the study subjects and informed consent was secured from each participant. Employees surveyed were told that the information provided would be confidential and that their identities would not be revealed in association with the information they provided. Health education related to occupational hazards was given to the all workers immediately after data collection. On encounters of unhealthy working

environment, recommendations were given to farm managers to enhance measures taken to alleviate the problems.

Results

A total of 578 individuals, with response rate of (94.44%, participated in this study. Among the 34 non-respondents, 21 were from the green house and 13 from the pack house, of which only three were males. No specific reasons were reported for their refusal to participate in the survey despite intense the sensitization effort made by the data collectors. Of the total respondents, 409 (70.8%) were living in the rural part of the study area. The majority 433 (74.9%) of the study participants were females, with 3:1 a female to male ratio. Their age ranged from 15 to 55 years with the mean age of 23.48 (SD=6.08). The age group 18-25 years, with a total of 398 study subjects (68.9%), constituted most of the respondents. Among the study population, the majority study subjects were married 314 (54.3%). There were also a high proportion of single subjects 246 (42.6%) and the rest 16 (2.8%) and 2 (0.3%) were divorced and widowed respectively. The dominant ethnic group of the study participants was Oromo, accounting for 51.6% followed by Amhara (28.0%). Regarding the educational status, most of the respondents, 335 (58%) had primary education, while those with technical and vocational education were only 2.4% (Table 1).

Regarding pattern of employment, the majority, 203 (52.4%), were contractual, 129 (22.3%) permanent and the rest 146 (25.3%) daily laborers. Among the 578 respondents, 219 (37.9%) signed employment agreements. The mean monthly salary of the respondents was ETB 505±248.8/month and, ETB 200 and 3000 were the minimum and maximum monthly salary of the study participants respectively. The majority (87%) of the respondents had monthly salaries of between 200 and 600/month. Average working experience recorded in the farm was 30.78±17.67 months. Three hundred eleven (53.8%), of the workers had experience from one year to two years and 112 (19.4%) between two to three years. The mean total working experience in the floriculture industry was 33.11±18.97 months. Five hundred thirty (91.54) of the respondents were not satisfied with their current job (Table 1).

Four job categories were described by the respondents and the majority 298 (51.6%) were working in green houses (GH) (which included supervisors, coordinators and cleaners in the GH), 156 (27.0%) pack house, 92 (15.9) spraying and 32 (5.5%) were irrigation (Table 1).

Table 1: **Socio-demographic characteristics of selected floriculture industry workers in West Shewa, Oromia, Ethiopia, Dec 2010-Mar 2011 (n=578)**

Characteristics	No of subjects	%
Residence		
Rural	409	70.8
Urban	169	29.2
Gender		
Male	145	25.1
Female	433	74.9
Age		
<17	35	6.1
18-25	398	68.8
26-33	105	18.2
34-41	28	4.8
>42	12	2.1
Marital status		
Married	314	54.3
Single	246	42.6
Divorced	16	2.8
Widowed	2	0.3
Ethnicity		
Oromo	298	51.6
Amhara	162	28.0
Gurage	79	13.7
Tegreay	10	1.7
Others	29	5.0
Educational Status		
Primary (1-8)	335	58.0
Illiterate	137	23.7
Secondary (9-12)	72	12.5
Reading & writing	20	3.5
Vocational	10	1.7
College	4	0.7
Job category		
Green house	298	51.6
Pack house	156	27.0
Sprayer	92	15.9
Irrigation	32	5.5
Pattern of employment		
Contractual	203	52.4
Daily labor	146	25.3
Permanent	129	22.3
Working agreement		
Yes	219	37.9
No	359	62.1
Monthly Salary (in Birr)		
<600	503	87
601-800	46	8.0
801-1000	19	3.3
>1000	10	1.7
Total service year in same job (moths)		
<24	280	48.4
25-37	122	21.1
38-50	80	13.8
51-63	54	9.3
>64	42	7.3
Satisfaction with current job		
Satisfied	48	8.46
Not satisfied	530	91.54

Behavioral factors: Table 2 depicts the description of selected behavioral characteristics. The data showed that the majority of respondents, 343 (59.3%) did not have full personal protective equipment. Among the respondents who did not have full personal protective equipment, but had partial PPE, 129 (37.61%) were using the equipment properly. Regarding the reasons for not using PPE properly, 128 (59.81%) responded inadequate supply, while 86 (40.18%) reported as the equipment is not comfortable for work.

Five hundred thirty three study participants (92.2%) had pre-employment safety training. Five hundred nine (88.1%) of the respondents were aware of the risk involved in working in flora industry. All most all participants did not smoke cigarettes 568 (98.3%), and did not drink alcohol (93.94%). Three hundred sixty four (63.0%) cooked their food in the main room. The type of fuel was, mainly wood or charcoal for (55.9%), butane gas (37.2%), animal dung (5.5%) and electricity (0.3%) (Table 2).

Overall health symptoms: About three hounded ninety two (67.70%) had at least one skin problems. Four hundred and sixty nine (81.10%) had at least one respiratory health symptom during the past 12 months prior to the study period, of these (78%) developed the symptoms following working at the farms. The major proportion of subjects with different health symptoms in the survey population 560 (95.85%) had at least one sign and symptom in the last 12 months prior to the study period, of those, 539 (93.25%) develop after joining the work and 407 (75.51 %) were female (Table 3).

Skin problems: The proportion of subjects with skin problem was 392 (67.8%).They had at least one sign and symptom of skin problem during the past 12 months prior to the study period, of which295 (75.25 %) were male. The distributions were Eczema 335(58%), itching 290 (50.20%), redness 250 (43.3%) and burning 216 (37.4%) (Figure 1).

Respiratory problems: The great proportion of subjects with respiratory problems, 469 (81.1%), had at least one respiratory health symptom during the past 12 months prior to the study time. Four hundred and fifty two (78.2%) developed the symptoms following working at the farms. Three hundred thirty six (74.3%) of these were female. The distribution of symptoms were: Cough 264(45.7%), shortness of breath 312 (54%), wheezing 240 (41.5%), sneezing 352 (60.9%), asthma 30 (5.2%) and chest tightness 234 (40.5%) (Figure 2).

Table 2: **Behavioral characteristics of selected workers in floriculture industry West Shewa, Oromia, Ethiopia, Dec. 2010= Feb. 2011 (n=578)**

Characteristics	No. of Study units	%
Full personal protection		
Yes	343	59.30
No	235	40.70
Properly using (n=343)		
Yes	214	62.39
No	129	37.61
Reason for not using properly (n=129		
Not provided	68	52.71
Not comfortable for work	61	47.29
Per-employment safety training		
Yes	533	92.2
No	45	7.8
Awareness on the risks involved		
Yes	509	88.1
No	69	11.9
Smoking cigarette		
Yes	10	1.7
No	168	98.3
Frequency of smoking (n=10)		
Sometimes	4	40.0
Usually	4	40.0
1-3 per week	2	20.0
Alcohol drinking		
Yes	35	6.06
No	543	93.94
Cooking and living in the same room		
Yes	214	37.0
No	364	63.0
Type of fuel used		
Wood/Charcoal	323	55.9
Butane Gas	215	37.2
Animal dung	32	5.5
Electricity	2	0.3
Other	6	1.0

Table 3: **Prevalence of different symptoms of disease among floriculture workers in West Shewa, Oromia, Ethiopia, Dec. 2010 – Feb 2011 (n=578)**

Health Problems	No. of subjects	%
Skin problems		
Yes	392	67.7
No	186	32.3
Respiratory problems		
Yes	469	81.1
No	109	18.9
Respiratory problems developed after join the work		
Yes	452	78.2
No	136	21.8
Overall health symptoms		
Yes	560	95.85
No	28	4.15
Develop after join the work		
Yes	539	93.25
No	39	6.75

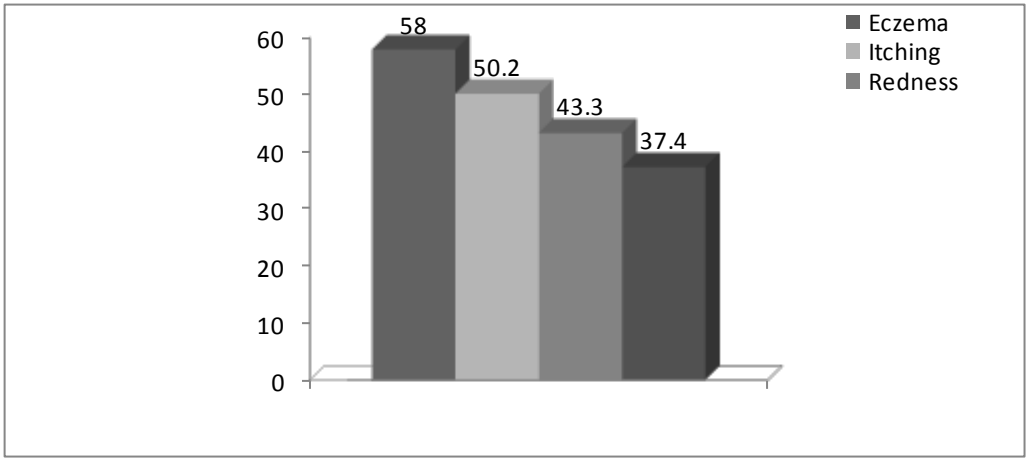

Figure 1: **Prevalence of skin problems among selected floriculture workers in West Shewa, Oromia, Ethiopia, Dec 2010- Mar 2011 (n=578)**

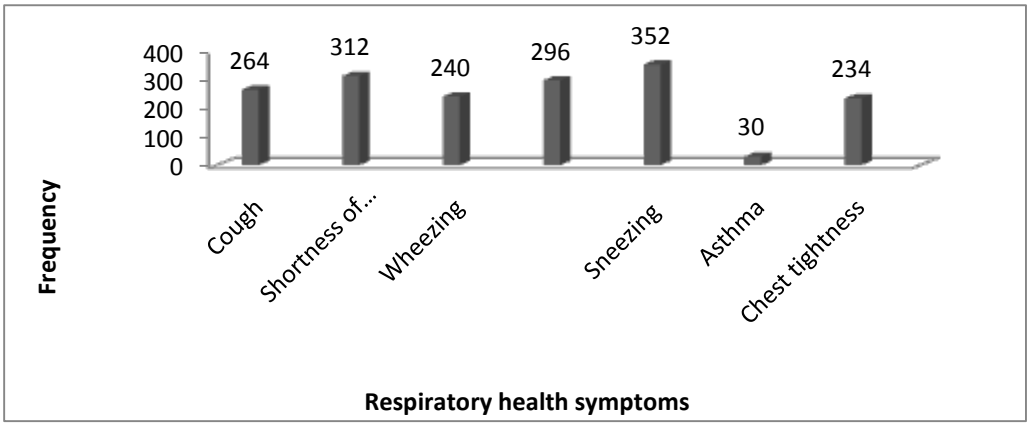

Figure 2: **Prevalence of respiratory health symptoms among selected floriculture workers in West Shewa, Oromia, Ethiopia Dec 2010-Mar 2011(n=578)**

***Other health symptoms*:** Proportion of study participants with different health symptoms were, headache 424 (73.4%), fatigue 442 (76.5%), irritation of the nose 233 (40.3%), irritation of the eye 218(37.7%), irritation of the throat 116 (28.2%), sleepiness 367 (67.5%), loss of appetite 205 (35.5%), back pain 327 (56.6%), kidney problem 243 (52%), dizziness 329 (56.9%) and fainting: 79 (13.7) (Figure 3).

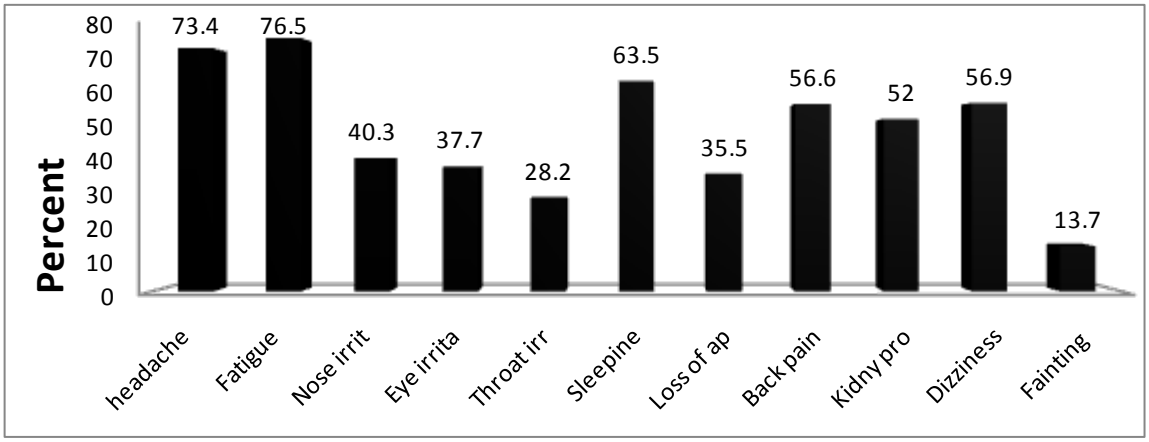

Figure 3: **Prevalence of different health symptoms among selected floriculture workers in West Shewa, Oromia, Ethiopia, Dec 2010-Mar 2011(n=578)**

***Work Environment Observation*:** The working environmental observation check list revealed that in all farm's green houses there was excessive heat and dust. There were no any safety signs and rules posted like danger sign. Most of the workers did not have the necessary personal protective equipment. There was no measure taken to prevent hazards, except some farms with some electronic controlling methods to adjust the temperature inside the green house. The farms gave milk for sprayers and breakfast for all farm workers. Most farms did not have copies of the most important safety and health regulation. They do not have safety personnel, except on one farm that had a nurse; others assigned one individuals with other commitments. All farms were not following written health and safety plan of action in work places in general. Most farms are located in the out skirt of towns, however; there were no health facilities near the farms. Even though most of the farms had first aid kit, it was not easily accessible.

***Predictors of occupational health problems*:** Using binary logistic regression analysis, working agreement, having full PPE, properly using and pre-employment safety training were independently significantly associated with the prevalence of health symptoms among the surveyed population. The odds of symptoms of disease were three times more among those who signed working agreements than those who did not: 2.89, 95% CI (1.45, 5.78). Having full PPE also showed that preventing; the symptoms of disease were three times more for those who did not have full PPE: 3.16, 95%CI (1.28, 7.80) than those who did risk. In addition, those who did not use the PPE properly had 4.93, 95% CI (1.44, 16.91) times' odds of symptom of disease than those who used them properly. Respondents who had not pre-employment safety training had 2.75, 95% CI (1.15, 6.61) more risk of symptoms of having any disease than those who had safety training. Awareness on the health risk of working in the farms proved to have not an independent significant association on the occurrence of symptoms of diseases (Table 4).

Table 4: **Distribution of independent factors of health symptoms among respondents by determinant at floriculture industry, West Shewa, Oromia Ethiop, Dec. 2010- Feb. 2011 (n=578)**

Characteristics	Presence of symptom		COR (95% CI)	AOR (95% CI)
	Yes # (%)	No # (%)		
Working agreement				
Yes	194 (88.58)	25 (11.42)	**3.18 (1.61, 6.25)***	**2.89 (1.45, 5.78)***
No	345 (96.10)	14 (3.90)	1.00	1.00
Full PPE				
Yes	229 (97.44)	6 (2.56)	1.00	1.00
No	310 (90.37)	33 (9.62)	**4.06 (1.67, 9.86)***	**3.16 (1.28, 7.80)***
Properly using				
Yes	126 (97.63)	3 (2.37)	1.00	1.00
No	184 (85.98)	30 (14.02)	**6.85 (2.05, 22.92)***	**4.93 (1.44, 16.91)****
Pre-employment safety training				
Yes	302 (94.18)	31 (5.82)	1.00	1.00
No	37 (82.22)	8 (17.78)	**3.50 (1.50, 8.16)***	**2.75 (1.15, 6.61)***
Awareness on health risks of working in the farm				
Yes	479 (94.10)	30 (5.90)	1.0	1.00
No	60 (86.96)	9 (13.04)	**2.49 (1.09, 5.29)***	**2.21 (0.97, 5.04)**

Discussion

The study was conducted primarily to assess occupation induced symptoms of diseases in the floriculture industry in West Shewa, Oromia, Ethiopia: Nevertheless, it provided valuable information about the general condition of workers in the plantations.

In this study, women workers made up the majority (79.9%) of the employees of the flowers industries. Similarly, in the study done in Uganda (54%) and Colombia (65%) were female (5, 10).

Most respondents working in the green houses reported that *"dizziness, blurring of vision and loss of weight attributed to the high heat in them"*. Another study indicated that prenatal pesticide exposure was significantly associated with a slight decrease in body mass index of 1.1 kg/m2 of their school age children (11). But in this study the majority of the respondents related the case with the heat and work stress in the green house.

In this study, the most prevalent symptoms of disease were: fatigue 76.5% followed by headache 73.4%: and sleepiness: 63.5%. Similarly, in another study, the most prevalent signs and symptoms manifested were: weakness followed by fatigue and muscle pain then by chills and fever (12).

Based on this study, 95.85% of study respondents had at least one symptoms of disease in the past 12 months, supporting the finding with a bit lower rate 2/3 (66.66%) of the symptoms of disease in the last 12 months prior to the study period (7). Moreover, findings in Philippines showed that 32% were symptomatic or had experienced pesticide related illness since their first use of pesticides (12). Other studies in Latin America have found that 50-60% of flower workers exhibit at least one symptom of

pesticide poisoning (10). The difference could be due to sample size and the working area condition that might not expose workers for different determinant factors.

In this study there was no significant difference on the occurrence of symptoms of diseases with respect to age. However, (AOR=5.51 95% CI 1.76, 17.24) more odds of having skin problems on older (>34 age) than the younger's (<17) was found. In contrary, younger farmers or workers more likely experienced agro-chemical related incidences than older ones elsewhere (5). This could be due to more susceptibility nature of extremes of age groups.

Majority (92.2%) of the respondents in this study reported that, they had pre-employment safety training which is congruent with the study done in Uganda, where 82% of all employees surveyed indicated that they had received job related training (5). However, the qualitative result of this study revealed that all participants had never been engaged on occupational health and safety training in the last 6 months prior to the study, which is contradicting to the quantitative result, the reason could be fear of job insecurity following disclosing the information.

Conflicting results have been reported in the literature about the influence of cigarette smoking, alcohol consumption and confounding factors in the occupationally exposed people (13). However, in this study, possible influence was avoided since almost all individuals (98.3%) did not smoke and (93.9%) did not drink alcohol.

In this study, 59.3% had not full Personal Protective Equipments. This is relatively higher compared with the findings reported in Uganda and Tanzania, which were 56% and 35 % respectively (14). In this finding, those who did not have full PPE had three fold odds of symptoms of disease than those who had (Adjusted OR=3.16, 95%CI (1.28, 7.80). In addition, those who did not use the PPE properly had Adjusted OR=4.93, 95% CI (1.44, 16.91) more odds of having symptoms of disease than those properly using it. Similar results were found in the study of different countries, that confident users were less likely to experience serious or moderate incidents (0.60(95% CI 0.44, 0.84)[6].Therefore having and using PPE properly is a preventive factor.

This study shows that, principles are often disregarded; many workers are forced to enter in to the green house right after fumigation. With the exception of one farm that has poster which shows spraying time and entry duration of 2.5 hours, the environmental observation check list confirmed that most farms have no safety signs and rules. Therefore, the immediate entrance to the sprayed GH could be a causative factor for different symptoms of disease manifested. In this regard, Concentration of air born pesticide after spray decreased by 95% during 12 hours after application, so recommendations were at least 12 hours to re-enter Green houses (15).

In conclusion, in this study most commonly identified health symptoms were skin problems, respiratory health problems and non specific health symptoms. The study has found prevalence of 93.25% health symptoms that was bit higher than studies done in Latin America and some African countries. Prevalence of skin and respiratory problems were 67.8% and 81.1% respectively. In category of health, especially skin problems are prevalent in pack house and on older age groups. The most prevalent health symptoms were fatigue (76.5%) followed by headache (73.4%) and sleepiness (63.5%). Lack of full PPE, improper use of PPE and absence of pre-employment safety training were observed as significant determinant factors for the occurrences of health symptoms. Most respondents stated heat, work load and chemicals as major causative agent for the occurrence of symptoms of diseases. Yet, though most of the respondents (88.1%) were aware of the hazards and prevention mechanisms, they did nothing to implement prevention measures. Prevalence's of different health symptoms were high due to lack of implementation of prevention measures. Especially non specific health symptoms were very high in relation to the heat in the green house and usage of chemical.

Finally, each farm management/administration should provide full personal protective equipment and try to enforce its usage like gloves, boots, gown and mask for sprayers. The farms should arrange pre-employment safety training and sensitization orientation regularly. The zonal social and labor office should follow the worker condition specially health and rights of employees. The farms should arrange prevention mechanism to minimize the exposure of workers to the specified causative factors, like heat, work stress and chemical contact. Longitudinal study is highly recommended to examine the real cause and effect relationship of implicated determinants.

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References

1. Premier Occupational Health Care. What is occupational health and wellbeing? [cited 2011 March]. Available from: URL:http//www.premirohc.co.uk/index.pph.
2. WHO. Hazard prevention and control in the work environment: Airborne dust. WHO Geneva 1999 W HO/SDE/OEH/99.14.

3. US Dept of Health and Human Services. The bloom on the rose: Looking into the floriculture industry. *Journal of the National Institute of Environmental Health Sciences* 2002;.110(5):240-247.
4. Wilson JT. Occupational health problem posed by agricultural pesticides. *AJPH* 53(9):1434-1436.
5. Go'mez-Arroyo SD. Angle MM, Villalbos PR, De Leo'n-Roder IJ. Cytogenic bio-monitoring in Mexican floriculture worker group exposed to pesticide. *Mutation Research* 1999;466(2000):117–124.
6. Thomson AJ. Causes and types of health effects during the use of crop protection chemicals in cut flower industry: data from survey of over 6,300 mall holder applicators in 24 different countries. *Int Arch Occup Environmental Health* 2009;82:935-949.
7. Lingerew M. Comparative cross sectional study of self reported health symptom among primary school children in relation to land fill. MPH Thesis: Addis Ababa University, 2007.
8. Takele T. Assessment of prevalence of work related injuries among small scale and medium scale industries in North Gnodar Zone, Amhara Regional State. MPH Thesis: Addis Ababa University, 2005.
9. Hansen E, Martin HD. Issues of migrant and seasonal farm workers. Old Town Clinic and Oregon Health and Science University page, 2008;156-159.
10. Harari R, Julvez J, Murata K, Barr D, Bellinger DC, Debes F, Grandjean P. Neurobehavioral deficits and increased blood pressure in school-age children prenatally exposed to pesticides. *Environ Health Prospect* 2010; 118(6):890-6.
11. Lu JL. Risk factor to pesticide exposure and associated health symptoms among cut- flower farms. *Int J Environmental Health Res* 2009;15(3):116-9.
12. Kesavachandran CN, Fareed M, Pathak MK, Bihari V, Mathur N, Srivastava AK. Adverse health effects of pesticides in agrarian populations of developing countries. Luckow, India: Epidemiology Section, Indian Institute of Toxicology Research, Council of Scientific & Industrial Research, 2005 [cited 2012]. Available from: URL:http://www.ncbi.nlm.nil.gov/pubmed?
13. Women Working World Wide. Promoting Women Workers' Rights in African Horticulture. Report of the planning meeting held on 31st January to 3rd February 2005. Kampala; 2007 [cited 2012]. Available from: URL:http://www.women-ww.org/documents/Promoting_Women_Workers_Rights_Planning_Meeting.pdf.
14. Giles DK, Welsh A, Steinke WE, Saiz SG. Pesticide inhalation, air concentration and droplet size spectra from greenhouse fogging. *Transactions of the ASAE* 1995;38(5):1321-1326.