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REVIEW ARTICLE

Prevalence of Occupational Exposures in Ethiopia: Systematic Review

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ABSTRACT

Because, todays, the world is suffered from chronic diseases which their etiologies are chemical and psychosocial hazards. Among them, the cancer and respiratory problems are the common which challenges of both developed and developing countries. Majority of its exposures are workplace. These challenges are very common in developing countries like Ethiopia. Similarly, the main objectives of this was to explore the prevalence of the occupational exposures in Ethiopia. Systematic review was applied to search scientific articles based on keywords, titles, and other searching strategies. All searching engines were applied like PubMed, web of science, Scopus, Embase and google scholar. Eligibility criteria was conducted based on the exclusion and inclusion rules. Occupational exposure in Ethiopia is very vast and complicated since its sources are not quietly addressed whereas occupational health services at workplace is infant stage. The literatures review conducted also revealed that occupational exposures to variety of the hazards were highly prevalent in occupational respiratory symptoms followed by needle stick and sharp materials injuries, especially for health care workers. The occupational dust exposures are significantly happened in both cement and coffee processing factories. The researches related to occupational lead and pesticides exposures are almost none, which needs attention in the next research gaps. Occupational exposure with radon at workplace was associated with a 2.62% increase (95% CI 2.52%; 2.73%) in mortality, independent of PM2.5 exposure which large mortality risks were observed among individuals from respiratory, cardiovascular and metabolic diseases which has highest association with others health problems. Preliminary assessment and environmental cleaning with appropriate protective device might be decreased the exposure. According to this review analysis, the occupational exposure with respiratory symptom was prevalence (85%) in cement factories followed by 78% in coffee processing factory. There was no intervention taken by the reviewers to indicate the reducing level of the exposure. However, as were recommended by the original researchers of those reviewed articles, wearing of protective devices and conditioning of the working environments can be reduce the exposure level of the workers at workplace. Pre intervention to workplace hazards is very important to minimize the exposure level at workplace and to reduce the cost of treatments. From these results point of view, conditioning(ventilating) the workplace, providing protective devices and designing appropriate engineering controls to minimizing the exposures levels are the key factors to reduce medical costs.

KEYWORDS: *Occupational exposures, chronic diseases, hazards, workplace*

INTRODUCTION

Occupational exposure is the workplace impairment because of the physicals, chemicals, biologicals, mechanicals and electrical hazards. The assessment conducted by researchers, indoor and outdoor radon R222n for residential areas 26.5+/-1.75 Bq/m (3) that is below the worldwide indoor mean of 40 Bq/m (3) and outdoor was 39.4+/-4.04 Bq/m (3) which is higher than the worldwide average outdoor radon concentration of 10 Bq/m (3,) (1, 2). In Switzerland, with other countries, exposure of the lung tissue to the short lived radon decay products is the most important component of the radiation dose (3, 4) . The ln (Rn) was associated with a 2.62% increase (95% CI 2.52%; 2.73%) in mortality, independent of PM2.5 exposure (3-5).

Health care workers like Nurses and Midwifes are the most suffering from the mechanical hazards like needle stick, nursing the patients, ergonomic design like patients' bed rooms, ejection and dressing are the sum of activities they faced in their daily activities and health care workers in Ethiopia are mostly suffered from the needle stick injuries because of carelessness, experiences and lack of wearing protective devices (6-8).

The respiratory problem with productive symptoms, occupational asthma, lead exposures, pesticides exposures (specially, systemic allergies and dermatitis), cancer, arsenic exposure, byssinosis, silicosis, pneumoconiosis, hearing loss are some common chronic diseases workers are suffered, (9-12).

The exposure from the electromagnetic field has risks for leukemia for children and low risks for adults,(13, 14). Therefore, the high power line station surrounding the resident, workplaces and commercials area are high risks for the cancer and other physical damage.

In the world, a low and middle income countries use only 20% of the world's agrochemicals, they 99% of deaths from acute pesticides poisoning cases, (15-17), in Ethiopia, as a few scholars revealed that intoxication with the pesticides in flower culture is much higher than in normal drawler based on the real time areal air sampling results and questionnaires survey based reports shown, (6, 8, 15, 18, 19) whereas the rate of occupational injuries are 10 to 20 times the industrial countries, (20-23).

The mean RF-EMF exposure in homes, schools and offices were between 0.04 and 0.76V/m whereas mean outdoor exposure values ranged from 0.07 to 1.27V/m with downlink signals from mobile phone base stations (13, 24-26). The effect of melatonin in humans have been in the presence of the electromagnetic fields by focusing on the effect of occupational or residential exposures, while some of the earlier studies show that EM fields may have suppressive effect on the melatonin, (24, 27-30) . Therefore, every workplace needs attention from all hazards point of views. Hence, the aim of this review is to assess and emphasis the prevalence of occupational exposures in Ethiopia by using systematic literatures searching.

METHODS

An electronic search of PubMed, web of science, Scopus, Embase and Google scholar on dated September 15, 2019 and updated on September 20, 2019 was conducted using a large strategy with three main components: prevalence (relate to workplace), occupational exposures in Ethiopia. Both indexed search term and free text were used that their results were available on requests. The search strategy was based on prevalence of occupational exposures in Ethiopia ((((prevalence [tiab]) OR prevalence [MeSH])) AND ((occupational exposure [MeSH]) OR occupational exposure [tiab])) AND ((Ethiopia [tiab]) OR Ethiopia [MeSH])

Subject specific and medical subject headings (MeSH) terms such as "Prevalence", "occupational exposures", "screening", "algorithms" and other broad terms were included in the search. The detailed search strategy with all terms for the five databases is included. We also screened reference lists of previous systematic reviews of occupational exposures. A total of 124 references were retrieved from all five sources after removal of duplicates and the inclusion of manually searched articles. Our final sample included 27 articles.

Eligible Criteria

The fist inclusion criteria was language, i.e the paper will be undoing to review must be in English language and related to the prevalence of occupational

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exposures in Ethiopia. The exclusion criteria were: case report, literature review, conference paper, unpublished paper, unrelated papers to exposure, injuries, prevalence of exposures, incomplete report and paper with low sample size, paper has no clear sampling procedure and unclear statistical tests.

Screening Process

Search results were imported into Systematic Review Endnotes X8.2 update and screened by two reviewers after a completion of the search and collected into the Library. Disagreements among reviewers were resolved by discussion until consensus was reached on inclusion or exclusion. Two levels of screening were used. The first valuation was available information imported to the electronic search by using Abstract, title, keywords. The second evaluation was screening by full-text reports for studies deemed potentially eligible after first level screening to decide its eligibility.

Quality Assessment Methodology

The studies was conducted by two reviewers. Both reviewers were collect their idea from the literature and wrote the in summary for discussion. After the dissuasion points were raised, very fruitful dialogue was conducted among the twos and coming to consensus to the agreement. For more emphases, reviewers' team manager consulted and the ambiguity was removed totally. The high quality literature and scientific articles were also screened based on the new version of Newcastle-Ottawa Scale adapted for cross-sectional studies to more address the prevalence of the occupational exposure in Ethiopia. According to the scale, there were about nine questions listed and dugout the quality of papers under review. The points were provided for each of the articles based on the sample size, representativeness, study design, validated laboratories method, non-respondents with related to response rate and also statistical presentation of the papers evaluated in depth. For high quality 9-10, medium 7-8 and low quality 5-6 was provided. There was also 0-4 marks on scale, unfortunately, our paper was record above it. Therefore, we haven't use it for this review.

Data Extraction

The criteria for data abstractions were based on the study design of cross sectional with related to sample size, location of the enterprises are there, any outcome of the exposures related to occupations. Exposures: respiratory problems, blood and fluids splash for the health care workers, workplace injuries, pesticides intoxication, and any others discussed in the paper was assessed. Analyses were done separately and combined after completion of the analyses.

RESULTS

From search strategy, we collected a total of 124 scientific articles. A total of 82 were deemed potentially relevant at first level screening. Finally, the reviewers, identified 27 scientific paper that are eligible for criteria.

From the screened literatures, about 33% of them were discussed about occupational respiratory problems followed by needle stick and sharp injuries which is 25%. The most respiratory problems were restrictiveness of the lung, chronic obstructive pulmonary diseases, stuffiness, short breathing and sneezing. Only one paper was discussed about occupational lead exposures which was conducted in Jimma city in one automotive car. This show that there was no crown eye seen the exposure in car industries and its maintenance activities, eg, Garages, Car Batteries, Automotive assembly and maintenances.

All of the researchers used the cross sectional/institutional based cross sectional study design to explore their research of questions with related to present situation of the exposures at work. Except very limited scholars, majority of them explained the magnitudes of the problems by associating with factors affecting the variables under studies. To limit the bias that will be occurred during data collection, except one the others described in well sampling procedures and was made the adjustment.

The validated laboratory sampling was tried to addressed by some of the researchers which their exposure under studies was need experimental proof, however, they haven't explained in which environmental condition they sampled like flow rate, pressure drops, humidity, wind direction, day/night, air condition(shiny, clouds, rainy or others). Those variables are directly or indirectly affecting our samples. The environmental factors: traffic sources

and meteorological conditions leading to higher air toxics concentrations in the winter and during peak-traffic hours, the seasonal effect of in indoor environments which affects the effect of outdoor sources were explained (31-33)

DISCUSSION

The chronic respiratory disease was high prevalence in cement factories (85% stuff nose, 62.9% with acute lung function reduction, 47% short breath and 27% sneezing), (34, 35) followed by coffee processing factory (55%),(36). The prevalence of the respiratory symptom and reduction of lung function may be related to cement dusts that will be need measure action to control and providing adequate personal respiratory protective equipment for the production workers.

The occupational exposure to blood and body fluids were high magnitude in jimma Zone of Public Hospital(78.3%),(12) followed by an Addis Ababa City of Public Hospitals (72.4%),(37) Conducted among health care workers. The exposures also significant in University of Gondar Hospital among health care workers (58.5%),(10) and low reported(42.6%) in the same public hospitals in Addis Ababa City as of study conducted(11). Since the two studies are contradict each other, because of the time varies they might be different. The first result was conducted before March of 2016 and the second was started from December 2016 to January 2017. Therefore, the occupational exposure to blood and body fluids might be improved by training, developing experiences, on job training or other interventions.

The study conducted in one automotive garage show that the Blood Lead Level (BLL) of the workers was above the threshold limit values which 10µg/m3. Above half (53%, 12-20µg/dl and 47%, above 20µg/dl) (38) of the workers were exposed to lead metal which can accumulate for a long year in our bone and other body fibers. This action values need immediate action to remove the workers from the exposures.

The needle stick injuries has recorded in the same public hospitals in Addis Ababa as discussed above which is 60.2%, (37) and its Attitude, reporting behavior and management practice of occupational needle stick and sharps injuries was similar with its accidents rate that is 58.7%,(39).

Occupational injuries are the most remarkable workplace challenging today. This accident has various etiology from the sources and on the process. According to these literatures, the needle stick injuries (50%), (37, 40)followed by injury related to building construction (41.4%),(17, 20, 41) were significantly happened.

The papers which are not explained their occupational exposure prevalence was not analyzed. Accordingly, from the total screened articles, 7.4 %(2/27) was not reported their prevalence rates of the exposures as well.

The lung functional reduction tests were happened by using digital spirometry according to American Thoracic Society (ATS) standards. Based on that FEV1, FVC and other parameters were tested by researchers. According to the result indicated, the respiratory symptoms and lung function reduction level were dictated like restrictive, chronic obstructive pulmonary diseases, occupational asthma, bronchitis's and short breath are some clinical trials identified.

The occupational exposure to blood and body fluids are the health care workers' challenging identified followed by needle stick injuries in same sector. The literatures concluded that exposed to needle stick and sharp materials on care providing services is because of carelessness, lack of experiences and fail to wear protective devices on job.

This indicates that if a causal relationship were to exist, it would be a very weak one. Results suggest that wearing protective devices on job and institutionalizing the results for the concerning body will be important, in fact, have a protective effect; this scenario is only theoretical, however, because of the lack of strong, high-quality evidence.

CONCLUSION

The needle stick exposure has high prevalence followed by respiratory disorders in factories have high dust prevalence. The occupational exposures assessment and analysis services are infant stage in Ethiopia and the factories have low commitment to improve the working environment safety. The future, research will be better if considering the occupational exposure to electromagnetic fields and Radon gases in context of Ethiopia by considering residential areas.

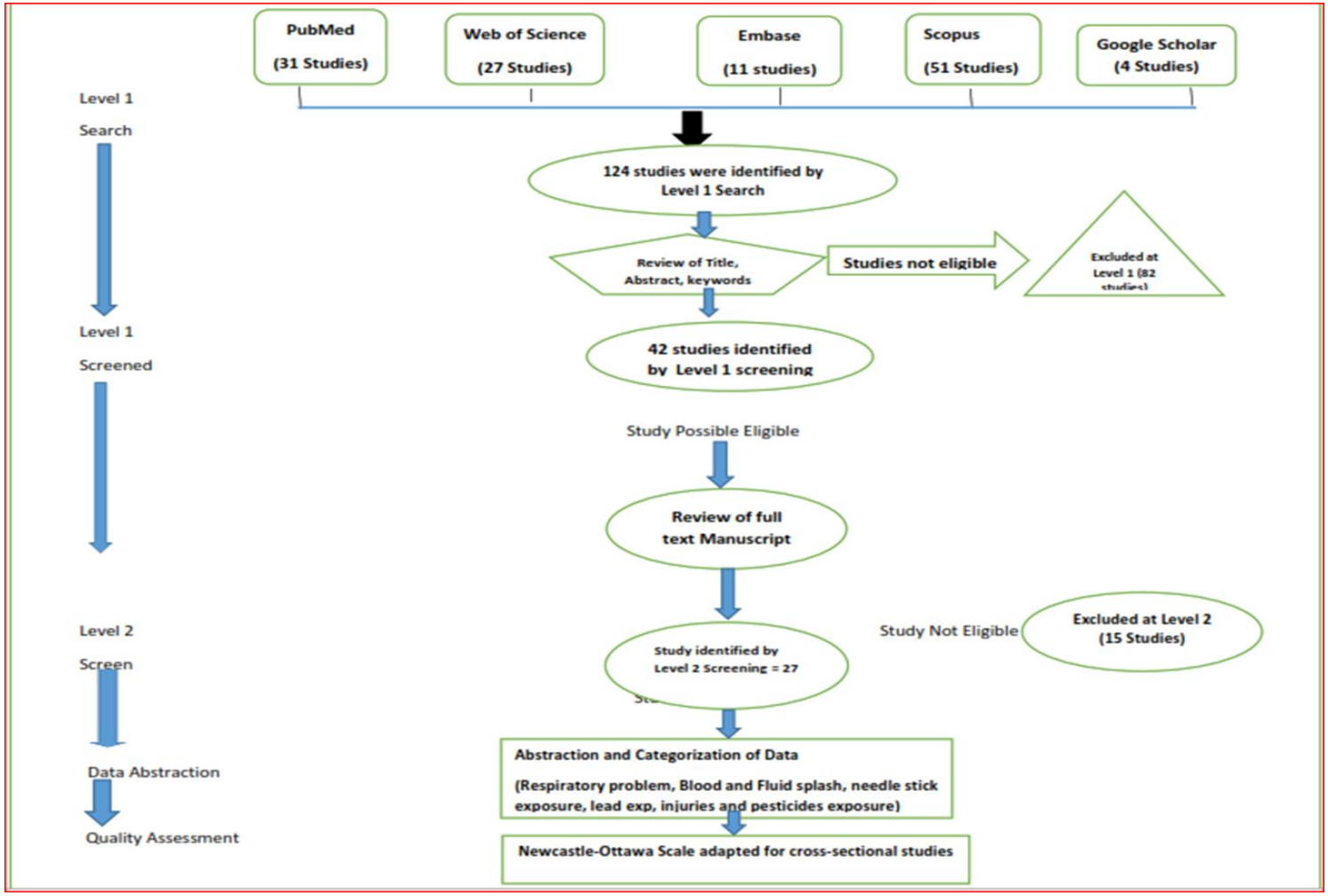

Fig. 1. PRISMA Flow Diagram

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Table 1. Quality Assessment Methodology

S/N	Author	Year	Title	Location	Criteria					
					Sample size	representativeness	Non-respondents	Statistical test	Validated laboratory methods	Methodology designed
1	Zeleke et al	2011	Lung function reduction and chronic	Ethiopia	262	-	-	Yes	Air sampler	Longitudinal
2	Zeyede K. eta al	2010	Cement dust exposure and acute lung	Dire dawa	40	Ok	no	Yes	Sampler	Cross Sec.
3	Jemal Y. et al	2019	Occupational exposure to blood and body fluids and associated factors	UoG	282	Not ex	9	Yes	no	“
4	Z.D.Woldesonbet	2016	Epidemiology of needle stick-sharp injuries (NSSIs) and potential high risk	AAU	Not clear	Not	not	No	no	“
5	Sebsibe T &Dagnachew	2016	Occupational injuries	AA	544	Not	40	Yes	no	“
6	Nigussie T. et al	2017	Occupational exposure to sharps injury	Northeast Eth	195	Not ex	5	Yes	no	“
7	Ayalu A. et al	2010	Standard Precaution: Occupational Exposure and Behavior	Eastern	475	Not ex	74	Yes	no	Descriptive
8	Amare W. et al	2016	Self-reported acute pesticide in toxic	-	516	11/68	4	Yes	No lab	Cross-Sec.
9	Nigatu et al.	2015	Respiratory symptoms, fractional exhaled nitric oxide & endotoxin	-	248	Not ex	-	Yes	Sampler	“
10	Negatu B. et al	2018	Neurobehavioral symptoms and acute pesticide poisoning	Commercial agriculture	256	-	no	Yes	no	“
11	Yoseph A., and Asrat B	1998	Relative Chronic Effects of Different Occupational Dusts on Respiratory	-	211	Ok	no	Yes	Spirometry	“
12	Abate L. et al	2018	A survey of work-related injuries	Southern	355	Ok	5	Yes	no	“
13	Manay K. et al	2013	Work related injuries and associated	AA	453	Not ex	9	Yes	no	“

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14	Getahun K. et al	2012	Needle stick and sharps injuries	Gondar	362	Not ex	18	Yes	no	“
15	Kaweti and Abegaz	2017	Magnitude of splash exposure and associated factors	Hawassa	526	Not ex	30	Yes	no	Cross sectional
16	Gizaw et al.	2016	Chronic respiratory symptoms	Dejen	404	Not ex	-	Yes	no	“
17	bebe Dilie et al	2017	Occupational Exposure to Needle Stick	Awi	193	Ok	20	Yes	no	“
18	Mentesinot W. et al.		Respiratory problems cotton textile	-	595	595/1470	-	Yes	air sampler	“
19	Demeke & Haile	2018	Assessment of Respiratory	AA	-	4/76	-	Yes	Spirometry	“
20	Dalju et al	2019	Occupational risk factors associated	Mojo city,	602	Ok	12	Yes	no	“
21	Daba Wami et al	2018	Cotton dust exposure and self-reported	Northeast,	413	Not ex	12	Yes	no	“
22	Yeshitila B. et al	2017	Blood/Body Fluid Exposure & Needle	Jimma	341	-	23	Yes	no	“
23	Bekele et al.	2015	Practice of occupational needle stick	Bale	362	Not ex	22	Yes	no	“
24	Adela et a	2012	Occupational lead exposure	Jimma	45	Ok	-	Yes	BLL	“
25	Samson W. et al	2018	Reduced Lung Function		225	Ok	13	Yes	Spirometry	“
26	Biniyam S G/Mariam		Determinants of occupational exposure to blood and body fluids	AA	323		46	Yes	no	“
27	Feyisa G, Zeyed K.	2019	Dust Exposure Associations with Lung	AA	75	-	-	Yes	Spirometry	“

Table 2: The Data Extraction from the selected scientific articles

S/N	Author	Year	Title	Location	Sample size	Prevalence of the Exposures in %							Methods
						Respiratory and Related	Blood and body fluids	Lead exposure	Needle injuries	Splash	Work place Injuries	Pesticide intoxication	
1	Zeleke et al	2011	Lung function reduction and chronic	Ethiopia	262	>48% of TLV							Air sample
2	Zeyede K. eta al	2010	Cement dust exposure and acute lung	Dire dawa	40	85%							Air sample
3	Jemal Y. et al	2019	Occupational exposure to blood	UoG	282		58.5		42.2				
4	Z.D. Woldesonbet	2016	Epidemiology of needle	AA			72.4		61.2	60.2	50		
5	Sebsibe T. Dagnache W.	2016	Occupational injuries	AA	544						38.2		
6	Nigussie T. et al	2017	Occupational exposure	Northeast	195						32.8		
7	Ayalu A. et al	2010	Standard Precaution: Occupational Exposure	Eastern	475		44		17.5		13.5		
8	Amare W. et al	2016	Self-reported acute pesticide intoxications	-	516							26	-no lab
9	Nigatu et al.	2015	Respiratory symptoms, fractional exhaled nitric		248							228/180 m^3	0.2 µm pore size
10	Negatu B. et al	2018	Neurobehavioral symptoms and acute	Commercial	256							16	No lab
11	Yoseph A., and Asrat B.	1998	Relative Chronic Effects of Different Occupational Dusts.		211	38.4							Spirometer
12	Abate L. et al	2018	A survey of work-related injuries	Southern	355						41.4		
13	Manay K. et al	2013	Work related injuries and associated risk factors	AA	453						33.3		
14	Getahun K. et al	2012	Needle stick and sharps injuries among health care workers	Gondar	344				30.8				
15	Kaweti & Abegaz	2017	Magnitude of splash exposure	Hawassa	496					28			

16	Gizaw et al.	2016	Chronic respiratory symptoms and associated factors	Dejen	404	62.9				
17	bebe Dilie et al	2017	Occupational Exposure to Needle	Awi	193			18.7		
18	MentesiW. et al		Respiratory problems		595	47.7				air samples
19	Demeke & Haile	2018	Assessment of Respiratory Symptoms	AA	Flour	27.7				spirometer
20	Dalju et al	2019	Occupational risk factors associated	Mojo	602	27.1				
21	Daba Wami et al	2018	Cotton dust exposure and self-reported	Northeast	413	47.8				No lab
22	Yeshitila B. et al	2017	Blood/Body Fluid & Needle Stick	Jimma	318		78.3		58.8	
23	Bekele et al.	2015	Attitude, & Management Oc. Needle.	Bale	362				58.7	
24	Adela et a	2012	Occupational lead exposure	Jimma	45			53 %-		BLL
25	Samson W. et al	2018	Reduced Lung Function in Coffee processing		225	55				Spirometry
26	Biniya S Gebremariyam		Determinants of occupational exposure to blood and fluids	AA	323		42.6		39	
27	Feyisa G, Zeyede K	2019	Dust Exposure Associations with Lung Function	AA	75	not ex.				Spiro Lab III

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