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# Perception of Environmental Health Risks among Workers in a Food and Animal Feed Manufacturing Industry, Jos, Nigeria

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**KEYWORDS**

risk perception,

industrial workers,

personal protective equipment

ABSTRACT

Background: Workplace safety relies partially on workers' ability to recognize hazards that could result in personal injury. This study aimed to determine the perception of industrial workers to the environmental risks that they are exposed to and their practice of self protection through the use of PPE.

Methods:
It was a descriptive cross-sectional study conducted among 128 workers of a cereal, oil and animal feeds manufacturing industry located in Jos South LGA of Plateau State. Data was obtained through a structured interviewer administered questionnaire and analyzed with Epi-Info 3.5.4.

Results:
Mean age of respondents was 31.3 ± 7.4 years and it was a predominantly male population (91.4%). There were multiple sources of information on risks. Most (99.2%) respondents obtained information from the media. Environmental factors perceived as 'high risk' were noise pollution (49.2%), air pollution from dust (46.1%), exposure to chemicals (45.3%) and accidents with machinery (45.3%). The mean self-perception score was 18.0 ± 3.4 and 78.1% of respondents had good perception of risk. There was inconsistent use of PPE by 83% of factory and laboratory workers.

Conclusion:
Good perception of risk was found among the workers but with poor consistent use of PPE. Results of the study may be used to design policies and programmes to help workers identify environmental health risks, and improve their attitude toward self protection.

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## Introduction

The environment plays a crucial role in the health of man. Much of man's ill-health can be traced to adverse environmental factors. The term risk refers to any attribute, behaviour or exposure which when present and active can lead to disease, ill health or injury. Environmental Health Risks (EHRs) are those factors in the environment which have the capability to cause deviations from health[1] This study lays emphasis on the work or occupational environment which is recognized for exposing workers to numerous preventable hazards.

Safety in the work place relies partially on the worker's ability to recognize hazards that may result in personal injury. Risk perception as defined by Sjoberg is the "subjective assessment of the probability of a specified type of accident happening and how concerned we are with the consequences".[2] To perceive risk one needs to evaluate the probability as well as the consequences of a negative outcome. Hence, the worker's correct perception of risk will consequently influence worker behaviour and subsequent exposure to risk.

Work related injuries and diseases worldwide account for a loss of about 4% of the global gross domestic product.[3] There are indications that people's understanding of environmental issues determines how they utilize environmental resources, which consequently affects the quality of the environment with a direct impact on their health.[4]

While sustaining the economic and material

basis of the society, workers are exposed to numerous preventable hazards in the work environment. According to International Labor Organization (ILO), over 2 million people die each year from occupationally related diseases and injuries in the work environment with another 160 million non-fatal diseases, and 270 million non-fatal injuries occurring annually. Such diseases and injuries in the work environment account for a loss of about 4% of the global gross domestic product.[5] Occupational injuries result in a sudden interruption of the work process which is traumatic for both the victim and his/her co-workers, who are subject to similar risks and constitute a burden for the company due to reduction in the number of personnel hours worked, and consequently a loss in production.[6]

The environment in which people live, interact and work has a huge influence on their health. Awareness of environmental health risks is a prerequisite to adopting preventive measures aimed at sustaining people's health. The notion that prevention is partially dependent on risk identification appears to be essential to some theoretical models which hold that the motivation for self-protective behavior is a function of anticipation of negative consequences of risk exposure and the desire to minimize these outcomes.[6] Hence, as in many other models related to the adoption of protective behavior, perception of risk plays an important role. Occupational diseases and injuries are a real threat to the worker. The ability of the worker to perceive if exposure is putting him/her at risk will influence the willingness of such individuals to adopt preventive measures.

The objective of this study is to assess the self perception of risk and use of Personal Protective Equipment (PPE) by workers in a food and animal feed production industry.

## Methodology

This was a cross-sectional descriptive study conducted in an industry located at Zawan, Jos South LGA of Plateau State. The industry consisted of three factories: a cereal mill, oil mill and feed mill. It is a highly automated industry where raw materials are processed and packaged within the factories. Other departments include Quality Assurance, Technical, General Administration, Human Resources, Safety, Health and Environment (SHE) departments and the Staff Clinic. It employs both temporary and permanent staff. The total number of permanent staff was 334. The minimum sample size was calculated using the formulae for cross-sectional studies for populations less than 10,000 at 95% confidence interval and using a prevalence rate of 12.9%[7] derived from a study conducted in Jos, Nigeria on risk perception among health workers. The calculated minimum sample size taking into consideration a 10% non-response rate was 124. The study population therefore consisted of 128 employees selected by stratified sampling technique from the various departments within the industry. Temporary staff, those on leave and those who declined to participate were excluded from the study. Data was obtained using a structured interviewer administered questionnaire which was adapted from a national Australian study on environmental health risk perception.[8] Data was analyzed using Epi Info 3.5.4. Risk perception was scored based on responses to specified exposures ranging from high (= 4), moderate (= 3), low (= 2) and no risk (= 1) with a maximum attainable score of 24. A score of 15

and below was rated as poor perception while 16 – 24 was rated as good perception. Consistency of the use of PPEs is indicated when all 4 PPEs (facemask, ear muffs / plugs, overall coats and safety boots) were used always by factory workers and 3 PPEs (overall coats, safety boots and operating hand gloves) were used always by other workers. Clearance was obtained from the ethical committee of the Jos University Teaching Hospital. Permission was obtained from the management of the industry and from participants before the commencement of the study.

Results

Socio-demographics: Mean age of the respondents was found to be 31.3 ± 7.4 years. The 20 – 29 years age group were dominant (49.2%). Majority of the population were males (91.4%). Most (63.3%) of them had attained a tertiary level of education. Workers in the factory mills made up 56.3 % of respondents, others included laboratory (17.2%), engineering / technical (7.8%) and support staff (18.7%) such as stores, transport, logistics and administration. Most (78.9%) respondents had worked in the industry for five years or less. (Table I)

Respondent's perception of EHRs: Majority (78.1%) of respondents had good perception of self risk. The mean risk perception score was 18.0 ± 3.4 with the factory mill workers having the highest mean score of 18.6 ± 3.4 as seen in Table II.

No statistically significant relationships were found with personal characteristics of the respondents (Table III).

Figure I shows that the environmental factors perceived as 'high risk' were noise pollution (49.2%), air pollution from dust (46.1%), exposure to chemicals (45.3%) and accidents with machinery (45.3%). Many respondents perceived inadequate lighting to be of 'low risk' (38.3%) or 'no risk' (22.7%) at all. Specific perception of exposure-effect relationships were sought for. Most respondents (61.7%) strongly agreed with an exposure – effect relationship of dust and chest conditions. Strong agreements by a smaller percentage of the respondents included untidy floors and accidents (50.8%), chemicals and skin burns (46.1%), noise and hearing (43.8%), dust and the eyes (39.1%), poor lighting and accidents (38.3%), noise and blood pressure (24.2 %) and noise and psychological states (15.6%). Specifically respondents disagreed (29.7%) or strongly disagreed (18.8%) with noise having an effect on psychological states.

Sources of information on EHR: There were multiple sources of information on risks. The level of information obtained from each source was also taken into consideration. Most (99.2%) respondents obtained information from the mass media, specifically radio, television and internet sources. Other sources included their employer, Ministries of Environment and Health, staff clinic workers, friends and relations, private organizations and co-workers. In respect to the quantity of information, respondents stated that most of the information they received came from the mass media (55%) and their employers (43%). A moderate amount of information was also stated to be obtained from friends / relatives (40.6%) and workers in the staff clinic (39.1%). Lesser amount of information was obtained from the Ministries of Environment and Health, co-workers and private organizations.

**Table I: Socio-demographic characteristics of respondents**

| Socio-demographic characteristics | Frequency (%) (N = 128) |
|---|---|
| **Age Group (years)** | |
| 20 - 29 | 63 ( 49.2) |
| 30 – 39 | 44 (34.4) |
| 40 – 49 | 19 (14.8) |
| 50 – 59 | 2 (1.6) |
| **Sex** | |
| Female | 11 (8.6) |
| Male | 117 (91.4) |
| **Marital Status** | |
| Married | 44 (34.4) |
| Separated | 1 (0.8) |
| Single | 83 (64.8) |
| **Level of education** | |
| Secondary | 47 (36.7) |
| Tertiary | 81 (63.3) |
| **Work Section** | |
| Factory mills | 72 (56.3) |
| Laboratory | 22 (17.2) |
| Engineering/Technical | 10 (7.8) |
| Others* | 24 (18.7) |
| **Employment years** | |
| 1 - 5 | 101 (78.9) |
| 6 – 10 | 13 (10.2) |
| 11 – 15 | 9 (7.0) |
| 21 – 25 | 5 (3.9) |
| **Religion** | |
| Christian | 126 (98.4) |
| Muslim | 2 (1.6) |
| **Tribe** | |
| Benue tribes | 21 (16.4) |
| Ibo | 9 (7.0) |
| Others | 20 (15.6) |
| Plateau tribes | 65 (50.8) |
| Yoruba | 13 (10.2) |

*Administration, Chain Supply, Logistics, Staff clinic, Stores, Transport

**Table II: Perception of risk to self mean scores**

| Work Section | Mean Score |
|---|---|
| Engineering / Technical | 16.1 ± 3.5 |
| Factory mill workers | 18.6 ± 3.4 |
| Laboratory/Quality assurance | 17.2 ± 2.8 |
| Others* | 17.5 ± 3.6 |
| All work section (General) | 18.0 ± 3.4 |

*Others: Admin, Chain supply, Logistics, Staff clinic, Stores, Transport

**Table III: Relationship between characteristics of the respondents and perception of risk**

| | Poor Perception | Good perception | |
|---|---|---|---|
| **Characteristics** | **Frequency (%) (N=128)** | **Frequency (%) (N=128)** | **p - value** |
| **Age** | | | |
| 20-29 | 8 (6.3) | 55 (42.9) | |
| 30-39 | 14 (10.9) | 30 (23.4) | 0.0507* |
| 40-49 | 5 (3.9) | 14 (10.9) | |
| 50-59 | 1 (0.8) | 1 (0.8) | |
| **Sex** | | | |
| Female | 2 (1.6) | 9 (7.0) | 0.5529* |
| Male | 26 (20.3) | 91 (71.1) | |
| **Marital status** | | | |
| Married | 13 (10.2) | 31 (24.2) | 0.1287 |
| Single | 15 (11.7) | 69 (54.0) | |
| **Level of education** | | | |
| Secondary | 9 (7.0) | 38 (29.7) | 0.5698 |
| Tertiary | 19 (14.8) | 62 (48.4) | |
| **Employment years** | | | |
| 1 – 5 | 21 (16.4) | 80 (62.5) | |
| 6 – 10 | 6 (4.7) | 7 (5.5) | 0.1141* |
| 11 – 15 | 1 (0.8) | 8 (6.3) | |
| 21 – 25 | 0 (0.0) | 5 (3.9) | |
| **Work section** | | | |
| Engineering | 5 (3.9) | 5 (3.9) | |
| Factory mill | 11 (8.6) | 61 (47.7) | 0.0700* |
| Laboratory | 6 (4.7) | 16 (12.5) | |
| Others** | 6 (4.7) | 18 (14.1) | |

* Fisher's exact
** Administration, Chain Supply, Logistics, Staff clinic, Stores, Transport

Perception of responsibility for protection: Most respondents believed that most of the responsibility for protection of the worker fell mostly to the Ministry of Health (64.8%) and the employer (63.8%). Only 51 (39.8%) stated that the worker had the most responsibility for protecting him / herself. A larger proportion (44.5%) stated that only a moderate amount of responsibility fell to the worker. The staff clinic workers were seen to have moderate responsibility in 61 (47.7%) of the respondents. Respondents however felt that a good level of responsibility was being fulfilled by the workers themselves (50.8%) and the employers (50.0%) in comparison to others.

Practice of self protection by workers: Figure 2 shows 109 (85.2%) and 108 (84.4%) of respondents would 'always' wear safety boots and overalls respectively, when indicated. Earmuffs were worn 'sometimes' by 51 (39.8%). Ear muffs were 'never' worn by 35 (27.3%) and eye goggles by 30 (23.4%) when indicated.

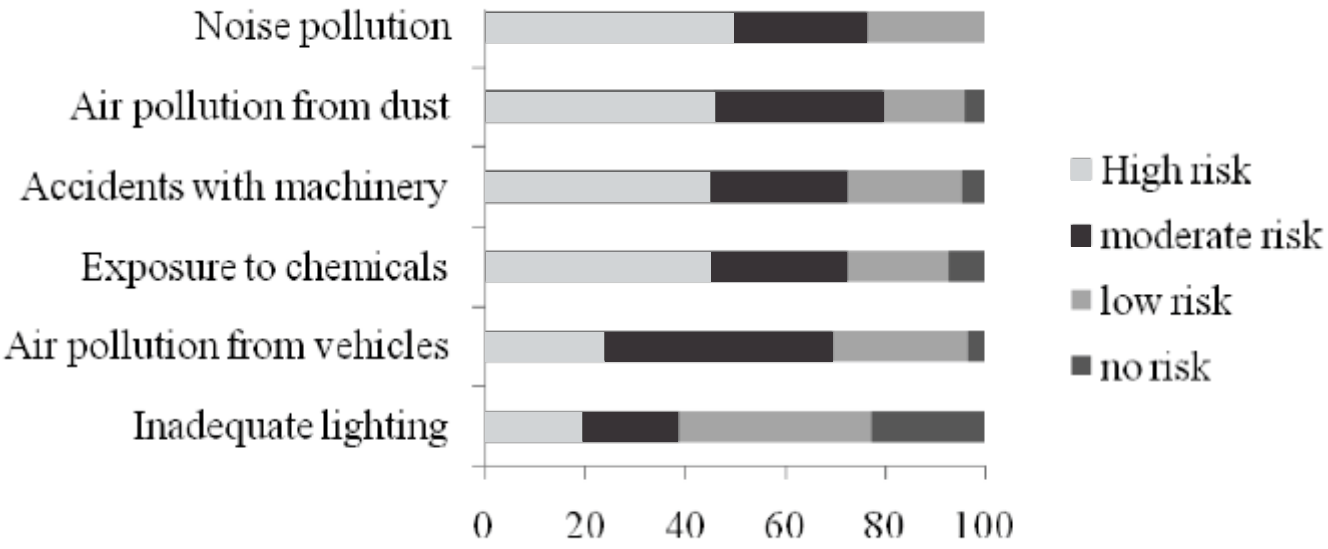
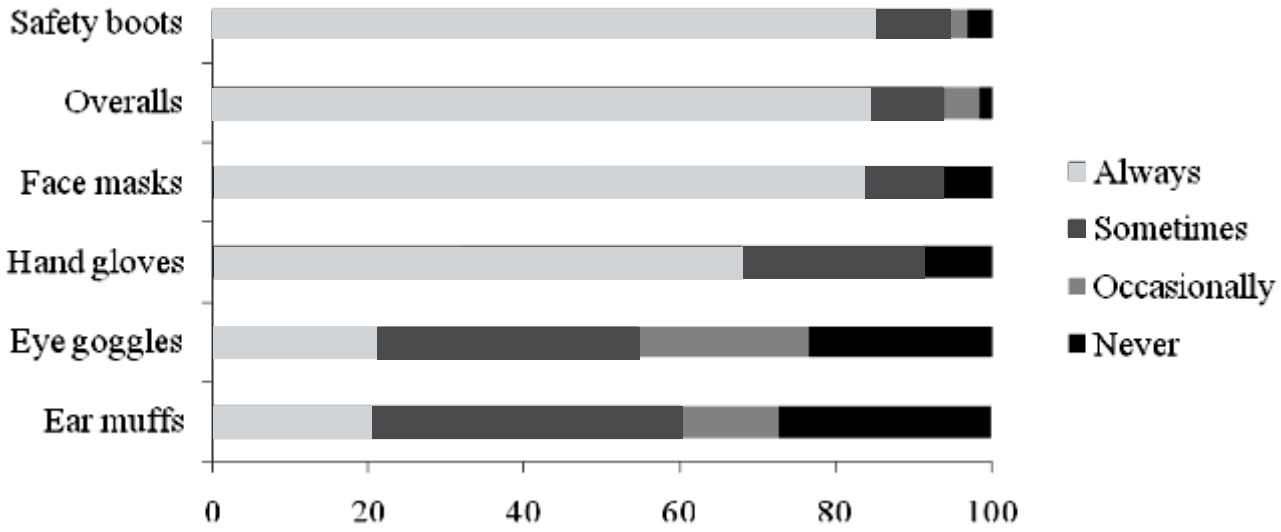



**Figure 1: Perceived risk to self**



There was inconsistent use of PPE by 83% of factory and laboratory workers who were required to wear them all the time. No statistically significant relationship was found (p =0.32) between the perception of risk to self and consistency in use of PPEs. (Table IV)

**Table IV: Relationship between risk perception and consistency in use of PPE among factory and laboratory workers (N=94)**

| | Consistent use | Inconsistent use | |
|---|---|---|---|
| **Risk perception** | **Frequency (%)** | **Frequency (%)** | **p-value** |
| Poor Perception | 4 (4.3) | 13 (13.8) | 0.3183* |
| Good Perception | 12 (12.8) | 65 (69.1) | |

*Fisher's exact

Discussion

The study population was a fairly young one which is consistent with what obtains in many industrial settings as they are the productive age group.[9,10] It is also predominantly male which is most likely due to the manual nature of the job.

Majority of the workers have a good perception of risk, though no specific relationships were found with their personal characteristics. The industry produces a lot of noise from the heavy machinery and dust from the milling of grains, hence air and noise pollution were considered as 'high risk' by 49.2% and 46.1% of respondents respectively. The effect of noise on hearing and dust on the respiratory system and the eyes were well recognized. The less widely known effects of noise on the blood pressure and psychological states were however not well recognized with up to 48% disagreeing with such effects. These point to the need for the content of the information being communicated to be reviewed to address specific exposures that relate to their work environment.

The good levels of risk perception by the respondents however did not translate into action as there was inconsistent use of PPEs by 83% of the factory and laboratory workers - the groups constantly exposed to all the investigated hazards. Though overalls and safety boots were worn 'always' by over 80% of respondents, other items such as facemasks, ear muffs, eye goggles and hand gloves were worn 'always' by less than half. Though the hazards of noise and air pollution were rated highly as perceived risks the use of ear muffs and face masks were less frequent. Personal Protective Equipments are the most frequently required preventive measure in industries but compliance varies and seems to be higher when enforced.[11] Workers are repeatedly found to state that heat and discomfort are reasons for reduced use of these PPE despite their

awareness of the importance of such items.[12]
The workers obtained information of EHRs from numerous and various sources. This is similar to what was obtained in the Australian study.[8] No respondent had obtained information from just one source. Having so much information available may have contributed to the majority of respondents having good perception of EHRs. This information can be of help in choosing channels for information dissemination in the planning of health education programmes. Most respondents felt that they had obtained most of their information from the radio, television and internet. It is positive information that 43% agreed that a lot of information came from their employer. This shows a deliberate attempt by the management of the industry to raise the awareness of the staff.
Though respondents recognized that the employer had a responsibility towards their protection, less than 40% stated that the worker had responsibility for protecting him/herself. Workers should be able to see that the final responsibility rests with them in protection from exposure and if equipments are provided but not used, the ultimate goal cannot be achieved.

The limitation of this study is in the fact that the findings are peculiar to this industry and may not be generalized to other populations.

## Conclusion

Though there was good perception of risk among the respondents, the behaviour of the workers for self protection was low as shown by their inconsistent use of PPEs. Most workers also did not perceive that they had a responsibility towards protecting themselves.
The study brought to light the need to assist factory workers in identifying environmental health risks especially through the quantity and quality of information dissemination by relevant authorities. There is also a need to design policies and programmes that would improve the attitude of workers towards self protection and also enforce compliance.

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