



Original Research Article

Occupational Health Works in a Flour Mill in Ilorin, North Central, Nigeria

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ABSTRACT

A descriptive cross-sectional study was carried out to determine the level of knowledge and health and safety practices among 123 flour mill workers in one of the flour mills in Ilorin, North Central Nigeria. Data was collected using structured interviewer-administered questionnaire, key informant interviews and walk-through survey between 02 September and 25 October 2013.

There was a laid down policy on health and safety for the staff but there was no adequate occupational health and safety facilities and services. There were no full-time occupational health personnel in the factory; nurses provided by the retainer hospitals, run 24 hour shift. Only the pre-employment medical examinations are routinely done for new employees; no periodic medical examination is done. There were no provisions for dust measurements in the factory environment. About 62 (50.4%) workers had good knowledge of occupational health and safety. No worker without education or primary education had good knowledge of occupational health and safety. There was statistically significant difference between different age groups as regards knowledge. A statistically significant association exists between awareness of perceived ill-health and the respondent's age and education.

The level of awareness of safety measures did not translate to use of personal protective equipment among the mill workers. Periodic medical examination for all workers and regular inspection of working environment by regulating agencies and training and health education programs for all workers emphasizing the correct use of personal protective measures should be provided.

Keywords: Flour mill workers, Health and safety practices, Personal protective equipment.

INTRODUCTION

Health hazards in the workplace form a major threat to a large proportion of the world's population. Approximately 75% of the world labour force is living in developing countries like Nigeria but only between 5-10% have access to occupational health services. ^[1] Occupational health services refer to the sum total of the

programmes and activities performed for the purpose of attaining the highest level of health and safety of the workers and their families. ^[2] The knowledge of occupational health and safety by workers is crucial for effective and efficient practices of occupational health services in work environment. Occupational health service focuses on health promotion,

diseases/hazard preventive services, curative services and rehabilitative services. [3] Occupational health services is a multidisciplinary activity aimed at the protection and promotion of the health of workers by preventing and controlling occupational factors and conditions hazardous to health and safety at work. [4]

Among the works of agriculture workers is the processing of raw cereals grains into flour, a finely ground particles. The act of flour milling utilizes different equipments such as windmills, watermills, horse mills, tread wheels and ship mills. The mill workers are thus exposed to harmful factors in their work environment from physical, chemical, biological, mechanical and psycho-social agents. [2] In addition, there are numerous safety and health hazards associated with grain handling operations, among them suffocation and falls are the two leading causes of deaths. Other hazards include fires, explosions, electrocutions, and injuries from improperly guarded machinery. [5] Noise hazard also occur in flour mills from equipments and machineries could result into temporary or permanent deafness in the workers. In some factories, noise level of up to 120 decibel may be generated. [6,7] Exposures to many different noise such as grain driers has cumulative effect and can cause damage even though worker may be exposed to a single source for short periods of time.

Exposures to grain dust and associated airborne contaminants can also occur; such as contaminants include molds, chemical fumigants, and gases associated with decaying and fermenting silage. [8] Flour mills generate a large amount dust, which is released into the air and later inhaled during industrial processes. [9] Flour dust is a hazardous substance, a respiratory sensitizer, the most influential agent perceived to be responsible for most respiratory system illnesses in a flour mill.

[10] Members of the public and families of workers are not spared of risks resulting from the act of flour milling if they live or work in the surrounding environment of the flour milling industry. [2,7] Flour mill workers are one of the occupational groups most affected by indoor air pollution in the work place. The management of flour milling industry may not be able to reduce worker exposure to flour dust to the levels below Threshold Limit Value (TLV) of 0.5 mg/m³ without the use of respiratory protection equipment. [11]

In many developing countries of the world especially in Africa and Asia, occupational health and safety practices are not well established. [12] The first indigenous occupational health service was established by the Nigerian Railway Corporation in 1899, followed by the Nigerian Coal Corporation in 1909. [13] Other establishments such as United African Company and John Holt set up more occupational health services, and later Shell BP Petroleum and other oil companies. While investigations into occupational health problems of various groups of workers have been conducted in Nigeria, very little attention has been paid to the health and safety of workers in grain industry. [8] There is thus paucity of literature on health and safety measures among flour mill workers.

The laws governing occupational health and safety were first put in place in 1941 with the introduction of the Workmen's Ordinance and this was followed by the Labour Code Ordinance of 1945 and the enactment of Factory Act in 1955. The present legislation regarding occupational health and safety of industrial workers is contained in the Factory Act of 1990. [14] The Act laid down policy and regulations on health and safety of workers in factories. Occupational health and safety in industries such as flour mill should be

assessed to investigate to what extent the minimum standards for health; safety and welfare of workers are attained.

There are two privately owned flour mill factories in Ilorin. The Mill under study commenced operation in 2005 and it is in the business of flour milling, processing and marketing of branded flour. Its product comprises of bread flour, confectionery flour, semolina and wheat Offal (Bran). The company imports its principal raw material, wheat (the hard red winter wheat No 2 variety) from United States of America, in shiploads. Wheat Silo Trucks thereafter convey the wheat from Lagos to the inland mill in Ilorin. The Mill is equipped with the latest flour milling technology and backed by technical expertise. The major activities of the flour mill may be subdivided into production, maintenance, quality control, logistics, sales and marketing, transport and human resources. The production involves milling and conversion to the final products, logistics ensures the inflow of raw materials and loading, distribution and warehousing of materials, quality control ensure that product meet standards and the quality as required by regulatory bodies while the maintenance department plan maintenance schedules, repairs and general maintenance of all company equipment. The workers in all these departments are regularly exposed to various quantities of flour dust in addition to other occupational hazards in the course of their work.

Each worker and their spouses and four registered dependants are entitled to free treatment. Emergency and routine medical services are handled for all staff in the on-site clinics while serious cases and those who need specialist care including those requiring detailed laboratory investigations are referred to the factory retainer hospitals. Only the pre-employment medical examinations are routinely done for new employees; no periodic medical

examination is done. The pre-employment medical examination does not include chest x ray and hearing assessment. The staffs also carry out food handler's tests every quarter as a mandatory requirement by the regulating government agency. Doctors render clinical services but do not involve themselves in factory inspection and other occupational health services. The only vaccine provided in the factory clinic was tetanus toxoid, as it is expected that the workers are generally prone to injuries of varying degrees. Health records were kept in the factory clinic but no evaluation of data is done. The main objective of this study was to determine the level of knowledge as well as health and safety practices of flour mill workers in Ilorin North Central Nigeria.

MATERIALS AND METHODS

This was a descriptive cross-sectional study carried out among flour mill workers in one of the two privately owned flour mill industries in Ilorin, the capital of Kwara State, North Central Nigeria. The factory produced about ten different wheat products and had the capacity to produce about 1000 metric tons of flour per day. The work system in the facility was continuous 24 hours/day and 7 days/week and divided into three shifts of 8 hours each to be changed every week.

Sample size was calculated using window's programs for epidemiologist for calculating simple proportion from previous literature with level of confidence set at 95% and degree of precision at 0.05 and level of awareness of safety measures at 99.5%. [15,16] The estimated sample size was 123. Using systematic sampling technique, a list of the workers was obtained to form the sampling frame; the sampling fraction was estimated and interval size of 2 was determined. The first respondent was randomly selected using simple random sampling by balloting technique. Subsequent

respondents were selected at interval of 2 until the desired sample size of 123 was attained. All the available employees of the flour mill were invited to participate in the study. The workers who have spent less than six months and were considered not to have had been adequately exposed to health and safety hazards were excluded from the study.

Data was collected using structured interviewer-administered questionnaire, key informant interviews and walk-through survey between 02 September and 25 October 2013. The workers were interviewed during the morning shift. A two sections pretested structured interviewer-administered questionnaire containing both open and closed ended questions was used to collect information from the respondents. Section A contained questions on socio-demographic characteristics of the respondents and section B contained questions on knowledge and awareness of hazards as well as safety and preventive measures.

The knowledge of the respondent's in regards to safety and health was categorized into the following: Good: Correct knowledge of functions of occupational health and safety services and knowledge of other hazards protecting methods in use in flour mill industry apart from personal protective equipment; Adequate: Correct knowledge of functions of occupational health and safety services but does not know any other methods in use in apart from personal protective equipment; Poor: Incorrect knowledge of function of occupational health and safety services and did not know any other methods that can be used apart from personal protective equipment; None: Not heard of occupational health and safety services, could not provide details about any hazard prevention methods. A pilot survey study was carried out on workers in another flour mill in Ilorin

to check the validity of the questionnaire. The necessary corrections were made on the questionnaire before the commencement of the study.

A walk through survey of the factory was conducted with the aid of a checklist to enable familiarization with the various production activities. A modified factory appraisal sheet based on the factory Act 1990 was used to assess the factory operations. [14] The process allowed direct observation of the practices of the workers at their jobs, assessment of the risks involved; evaluation of the safety control measures in place, assessments of the dimensions of the factory and environmental parameters, the use of personal protective equipments and their functionality. The inspection was done in the company of the safety manger and a nurse from the company sickbay.

In other to ensure ethical standards in the research procedures, written permission was obtained from the management of the flour mill. Ethical approval was also obtained from the research and ethics committee of Ladoke Akintola University of Technology Teaching Hospital (LAUTECH), Ogbomoso before the commencement of the study.

All data generated were revised, checked for completeness and coded for computerized data entry. Data was analyzed using Statistical Package for Social Sciences version 17 software and the results presented descriptively as frequency tables. Discrete variables were presented with use of tables and percentages. Fisher's Exact and Chi Square test were used to test for difference as appropriate. Level of significance was set at 5%. A manual content analysis of the qualitative data was done and tables were constructed by systematic organization and categorization of the information contained in the interview and observation notes.

RESULTS

The factory had 288 workers out of which questionnaires were administered to 108 apparently healthy males and 15 females that were selected for the study. The mean age was 35.6 (8.7) with majority 85 (69.1%) between 30-49 years. Most of the respondents 108 (87.8%) were males. Ninety eight (79.7%) had education ranging from primary to tertiary, while 25(20.3%) had no education. Forty six (37.4%) had spent above 5 years as a flour mill worker.

Table 1 showed the knowledge of workplace hazards by respondents. About 62 (50.4%) workers had good knowledge of occupational health and safety, 37 (30.1%) and 24 (19.5%) workers had adequate and poor knowledge respectively. There was statistically significant difference between different age groups as regards knowledge. Of the 62 with good knowledge majority 50

(80.7%) were between the age range 30-49 years while 6 (9.7%) were within the age range 20-29 years. Pertaining to educational levels, no worker without education or primary education had good knowledge of occupational health and safety. No significant difference was observed between workers with no education and those with primary education. However, comparing the knowledge of workers with tertiary education and those with no education attained statistical significance, $p < 0.05$. But such difference was not attained between workers with primary school education and those with tertiary education. Forty (32.5%) of the workers that had spent longer than 5 years had good knowledge. Workers knowledge attained statistical significance as regards to the length of years spent in flour mill industry, $p < 0.05$. (Table 1)

Table 1: Distribution of the knowledge of safety measures among flour mill workers

Variables	Response				Statistics	
	Good	Adequate	Poor	Total	χ^2	p-value
Age groups (years)						
20-29	6	6	0	12	16.25	*0.039
30-39	28	15	9	52		
40-49	22	9	15	46		
50-59	6	6	0	12		
>60	0	1	0	1		
Total	62	37	24	123		
Educational status						
None	0	2	6	85	7.86	*0.000
Primary	0	9	8	17		
Secondary	14	10	10	34		
Tertiary	48	16	0	64		
Total	62	37	24	123		
Years spent in the industry						
< 1year	0	6	6	12	18.22	*0.001
1-4 years	16	9	9	34		
> 5 years	46	22	9	77		
Total	62	37	24	123		

* $p < 0.05$

Table 2 showed the practices of occupational health and safety by flour mill workers. The use of Personal Protective Equipment (PPE) among the workers was high as 56 (45.5%) had used personal protective equipment all the time, 49 (39.8%) sometimes while 18 (14.6%) had

never used PPE. Of the 18 that never used PPE 8 (44.0%) had spent between 1-4 years while 3 (33.0%) had spent less than 1 year. Nine (50.0%) of them had no formal education while 6 (33.3%) had primary education. These findings were statistically significant, $p < 0.05$. (Table2)

Table 2: Distribution of the practices of occupational health and safety by flour mill workers

Variables	Response				Statistics	
	All the time	Sometimes	Never	Total	χ^2	p-value
Age groups (years)						
20-29	18	13	1	32	**20.34	*0.001
30-39	16	20	10	46		
40-49	20	16	3	39		
50-59	1	0	4	5		
>60	1	0	0	1		
Total	56	49	18	123		
Educational status						
None	2	14	9	25	**46.39	*0.000
Primary	2	9	6	17		
Secondary	24	16	3	43		
Tertiary	28	10	0	38		
Total	56	49	18	123		
Years spent in the industry						
< 1year	14	16	3	33	**7.66	*0.001
1-4 years	15	21	8	44		
> 5 years	27	12	7	77		
Total	56	49	18	123		

**Fisher's Exact

*p<0.05

Table 3: Occupational Health Facilities and Personnel in the flour mill

Vatiables	Number	Remarks
Total number of workers	288	
Available Facilities		
Industrial Ambulance	-	Cases transferred with utility vehicle
On-site staff clinic	1	Constrained by space
Industrial hospital	-	Cases requiring specialist referred
Retainer Private Hospital	2	Too much emphasis on curative medicine
Canteen	1	Not operational at the time of study
Available Key Personnel		
Full-time Industrial Physician	1	Visiting doctor not an occupational physician
Full-time Industrial Nurse	3	Not trained occupational health nurses
Full-time First aid specialist	4	Trained among the regular staff
Full-time Industrial Hygienist	-	No provision is made yet for visiting Hygienist yet
Full-time safety Engineer	-	Head of security is designated as Safety Manger
Nutritionist/Caterer	-	Workers purchase food from vendor outside the factory
Safety Committee	Yes	In place and active; meet quarterly

Table 3 detailed the occupational health facilities and personnel in the factory. The factory had an on-site clinic but without industrial ambulance and the staff canteen was not operating due to some logistics reasons, so the member of staff had to go out of the premises to get food from the uncertified vendors. Additionally, there was no industrial hospital and no full-time occupational health personnel but two retainer private hospitals located about 3 and 5 Km respectively outside the factory provided services to the factory. Doctors occasionally pay visits to the facility. Resident doctors from the Department of

Community Medicine, LAUTECH, Ogbomoso provide occupational health services to the factory whenever they are on their one month occupational health posting.

As shown in Table 4, a statistically significant association exists between awareness of perceived ill-health and the respondents age and educational status, p<0.05. The respondents within age group 40-49 have the greatest proportion, 84.6%, of those that perceived ill health while those in age group 50-59 had the lowest, 20.0%. On the educational status, the perception of ill-health associated with flour milling industry increases with the level of

education with those with tertiary education having the greatest proportion, 92.1% while those with primary education had the lowest, 58.0%. Of the type of perceived ill-health,

those that reported cough have the highest proportion, 93.3% while aches/pains had the lowest, 48.0%.

Table 4: Awareness of perceived ill-health in flour mill workers by selected characteristics

Variables	Awareness of perceived ill-health			
	Yes	No	Statistics	
	n=95 (%)	n=28 (%)	χ^2	p-value
Age groups (years)				
20-29	28	4	**12.30	*0.006
30-39	32	14		
40-49	33	6		
50-59	1	4		
>60	1	1		
Educational status				
None	16	9	**10.9	*0.014
Primary	10	7		
Secondary	34	9		
Tertiary	35	3		
Years spent in industry				
< 1 year	28	5	1.62	0.442
1-4 years	32	12		
> 5 years	35	11		
Perceived ill-health				
Cough	29	6	**22.5	*0.001
Chest pain	28	2		
Lung diseases	2	1		
Aches/pains	12	13		
Red eyes	8	5		
Cuts/wounds	3	1		
All ill-health	13	0		

**Fischer's exact

*P<0.05

Table 5: Environmental and social services in the flour mill

Recommended practices	Remarks
Location	Located in demarcated industrial zone
Building	Free of dampness
Factory height (lowest place)	2.14 meters
Workspace	11.33 cubic meters
Ventilation	Natural and local exhaust
Illumination	Natural and fluorescent lamps
Environmental temperature control	No central cooling system
Housekeeping and maintenance	Twice daily cleaning, dust suppression
Sweeping of workrooms	Twice daily and
Refuse disposal	Refuse bins provided. Municipal waste disposal
Washing facilities/mopping factory	Daily
Water supply	Portable water from nearby Dam regular
First aid facilities	Only at the sickbay
Sanitary conveniences/functionality	4 toilets in the operational areas are functional
Fumigation of premises	Monthly
Clearing of bushes	Regularly
Catering	Canteen shut down due to logistics

Table 5 detailed the environmental and social services in the flour mill. The building housing the milling equipment, the bagging section and the warehouse had a floor-ceiling height of 2.74 meters (9 feet) and a workspace of over 11.33 cubic meters.

The other buildings had less dimensions. Cleanliness was maintained by sweeping and proper disposal of solid waste through the city waste disposal authority. Mopping was also done at every shift and walls and ceilings were regularly painted. Good

ventilation with adequate supply of fresh air and exhaust ventilation to remove dust. The natural light from daylight was ensured with large windows and installation of reflectors while artificial light fluorescent light amplify the lighting effect. The factory had four toilets in the operation area; three labeled for the males and one for female workers. This is grossly inadequate. The other departments also have adequate sanitary conveniences. All the toilets were all in good working condition. There was provision for the supply of clean water from nearby city dam. Fumigation of factory premises and clearing of bushes were done regularly. There was good maintenance of equipments/machines in the factory. There was daily cleaning of dust on machines in addition to toilet soaps and disposable towels. There were no provisions for dust measurements in the environment. This is particularly relevant in disabling and irreversible occupational lung diseases with long incubation period. Wet methods were employed for dust suppression there was good and effective drainage system.

DISCUSSION

The factory lacks occupational physician, industrial nurses, first aid specialists, hygienists, ergonomist and an occupational psychologist. There was also no industrial ambulance. The clinic space was also very cramped and lacked privacy for the patient and there was no proper sterilization of the dressing instruments. With about 269 workers and approximately 5 dependants per worker there is the need for an ideal occupational health service for this factory will be cost effective. Retainer hospitals used by this factory completely ignored preventive medicine. There was no documentation and analysis of the types of cases seen which would have provided bases for preventive measures. Retainer hospitals should offer specialist services that

complement rather than duplicate the services provided by ideal industrial hospitals and so should be reduced to one instead of the existing two. The deficiencies noted in this study have been shown to promote curative medical practice and hampers the delivery of recommended services needed for occupational health, safety and welfare of these workers. [17,18]

The pre-employment medical examinations in the factory are grossly inadequate. Considering the likely effects exposure to dust would likely have on a candidate with compromised lung functions, not only chest x ray (which is not even done) but a baseline lung function assessment is required in this type of settings. There are specific hazards that abound in this type of factory that necessitate periodic medical examinations for these workers. For example in production, packaging, warehouse and maintenance units where exposure to flour dust is high, bi-annual lung function tests and chest x ray are necessary while food handlers should undergo six monthly microbiological investigations. Workers immunization should be expanded to include vaccination against hepatitis B, typhoid fever, yellow fever, meningitis and cholera infections and should follow the World Health Organization schedule. [4]

The flour mill medical policy offers free comprehensive health services to all employees and 5 dependants. This is contrary to the findings of other researchers who worked variously on occupational health services in different part of Africa. [12,19,20]

They both concluded that occupational health services in Africa is not yet developed and also noted that the extent of the occupational health service provided by a company depends largely on its financial status as well as the social conditions and size of the workforce.

In this study significant proportion 62 (50.4%) of the respondents had knowledge of health and safety measures including the use of personal protective equipment; the knowledge increased with possession of higher level of formal education as higher educational status has been found to influence awareness of safety measures. [21] (Table 1) The high level of knowledge demonstrated by the respondents did not translate to use of personal protective equipment among the workers as only a (56) 45.5% of the workers used these equipments all the time. This finding was statistically significant, $p < 0.05$. (Table 2). The existence of gaps knowledge and correct practice of the use of personal protective equipments have been reported, therefore it is important to educate the workers about correct use of these equipments that is made readily available and culturally acceptable with the aim of reducing their vulnerability to hazards in flour milling industry. [24-26]

Personal protective equipment in form of safety boots, overall, goggles, hand gloves, cap/helmets, ear muffs, respirator and face masks were provided but were inadequate in quantity and correct sizes. Earlier in the year two health education seminars were conducted for the workforce though the company policy stipulated it should be done quarterly. Fire drills are organized monthly and regularly for the workers. Safety posters and alarm system were in place, the posters were new and bright. The company's Health and Safety policy which contains information on safety practices was regularly updated and made available to all staff in form of booklets. Relevant section of the policy was also made available to all contractors who were also routinely trained and made to comply with such in every step of job execution. The flour mill had a safety committee consisting of the management staff and

supervisors with the safety officer as the secretary which was committed to ensuring safety at the work place. The Committee also offered incentives to workers who abide by the safety rules and regulations. The Committee holds regular meetings (every quarter of the year). The safety committee also publishes, every two months, a bulletin "Health, Safety and Environment Bulletin". Additionally, there were regular training sessions on safety at commencement of employment as well as on-the-job-supervision. Regular inspections were conducted by officials of Federal Ministry of Environment, Labour and the State and local government health department. The National Agency for Food and Drug Administration and Standard Organization of Nigeria also conduct mandatory assessment of the factory.

Compliance to safety measures and the use of personal protective equipments have a direct association with the worker's knowledge of their workplace hazards, their level of education as well as their degree of satisfaction with the personal protective equipment provided. [22-26] The use of personal protective equipment has always been a problem among workers and its use is very low. [24,25] The hazards might be obviously glaring and discomfoting but personal protective equipment is sometimes regarded as "less tolerable" than the hazards. [26] For the workers in this industry, it is of utmost important that the use of personal protective equipment be strictly adhered to as with the most up-to-date technology and proper cleaning procedures in place, the flour milling industry may not be able to reduce worker exposure to flour dust to the levels below TLV of 0.5 mg/m^3 without the use of respiratory protection equipment even in highly automated mill. [10] The finding in this study contrasted the Pakistan study where personal protective equipment was available and was in use by workers. [5] It is

the responsibility of the employers to ensure that a flour mill is designed, staffed and equipped in such a way to eliminate hazards or at least reduce them significantly. [8]

The level of educational also influenced the awareness of perceived ill-health by these workers. This observation was statistically significant, $p < 0.05$. (Table 2) Majority of the respondents were aware of ill-health like cough 29(23.6), chest pain 28(22.7), and 12(9.8) aches/pains, but only very few mentioned serious condition such as lung diseases 2 (1.6%). These observations were statistically significant, $p < 0.05$ This is consistent with previous studies where educational status positively influenced the awareness of diseases. [27,28]

The fire fighting equipments were adequate in the mill. The fire drills were also carried out regularly. The health talks given were not adequate and should be made regular. The work environment and sanitation were observed to be adequate. The workrooms in the operational areas had adequate workspace and but the overall cleanliness and sanitary conditions were unsatisfactory. Ideally, there should be one toilet for 25 males or 20 females. [4]

The management enforcement of safety standards was observed to be very weak particularly on the use of personal protective equipment. The government regulatory and monitoring roles were also observed to be grossly deficient. This was blamed on the weak factory inspectorate systems by previous researchers in Africa. In some African countries, there were only 68 factory inspectors to 5,895 registered factories as at 1995 and this explains to a large extent why safety laws and regulations are hardly enforced by the ministry of labour due to manpower shortage. [18] Since many governments do not have enough adequately trained inspectors to inspect every workplace regularly it is up to workers and

unions to be the regular “workplace inspectors” and make sure employers are complying with existing laws and standards. [29]

CONCLUSION

In conclusion, although there is provision of health facilities and nursing personnel in the flour mill industry studied, what was provided was inadequate and far below standards set a medium scale industry. The standard of occupational health services was not in accordance with the best global practices. Environmental protection facilities and personnel were not employed and equipments were not provided. There was a very high awareness and knowledge of health safety measures which did not translate to utilization of personal protective equipments. Enforcement of regulations by the management and monitoring by regulating government ministries and agencies were poor. The study recommend the improvement of worker’s health and safety through: performance of periodic medical examination for all workers in the factory, regular inspection of working environment by regulating agencies for measurements of dust concentration, noise level, illumination and ventilation. Training and health education programs should be provided to all workers from the start of work emphasizing the correct use of personal protective measures.

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Conflicts Of Interest

No conflict of interests exists between the authors.

Contribution of Authors

This study was carried out by all authors. 'STA' designed concept of the study, wrote the protocol, did the literature search and led the team in data collection. The author 'JTA' was involved in literature search, data acquisition and data analysis. Author 'IAA' was also involved in data collection, manuscript preparation and manuscript editing.

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