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Prevalence and Associated Factors of Occupational Ocular Hazards among Workers in Groundnut Oil Production Industry at Dakata Sabuwar AU, Kano, North- Western Nigeria

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Abstract
Background: The prevalence and associated factors of occupational ocular hazards among workers in groundnut oil Production Companies contribute to the burden of visual impairment and blindness leading to severe morbidity and immense economic loss in several developing and developed countries. **Aim:** This study aimed to determine the prevalence and associated factors of occupational ocular hazards among workers in the groundnut oil production industry at Dakata Sabuwar AU, Kano North-Western Nigeria. **Methods:** A prospective study was conducted on two hundred (200) workers aged eighteen (18) years and above. A pen torch was used for the examination of the ocular structures of the participants. A structured and validated questionnaire was administered as research material. Data was collected using research instruments regarding age, marital status, and educational status, man hours, years of engagement, causes and distribution of injuries. Participants were grouped according to age range. Collected data were stored and analysed using the Statistical Package for Social Sciences (SPSS) version 20. Chi-square was used to test the variables; a P value of (0.000) less than (0.05) was considered statistically significant. **Results:** Out of 200 participants, 200 (100%) were males. The majority of workers 49.5% are between 20-29 years with a mean age of 29.95 ≠ 9.3. The most prevalent occupational hazards experienced were Groundnut Husk (35.0%), Machineries (20.0%), Sun (18.5%) and others (26.5%) including splashes of hot oil into the eye. The study revealed pterygium (24.0%), laceration (20.0%), penetrating injuries (12.5%), blunt trauma (9.0%) and others (8.5%) as the most common eye disorders among workers. **Conclusion:** The findings established that the factors associated with ocular hazards among workers in the Groundnut oil production industry were groundnut husk, machineries, sun and splashes of hot oil into the eye. Workers had a low level of awareness and knowledge of occupational ocular hazards and wearing of personal protective equipment (PPE).

Keywords: *Groundnut, Occupational, Hazards, Personal Protective Equipment (PPE), Industry*
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Introduction:

Groundnut (Arachis hypogaea L) originated in South America (Weiss, 2000), as one of the most universal and popular crops cultivated in more than 100 countries in six (6) continents (ICRISAT, 1999). China (40%), India (23%) and Nigeria (8.4%) are major producing countries (World Bank, 2003). Groundnut is produced mainly in the North East, North West and North Central Nigeria, especially in Kano State (RMRDC, 2005).

The total output of groundnut for Nigeria in 2002 was 1,976,490.80 tonnes with a range of 47.00 – 73,000 for the states. The mean groundnut output from the farmer's field for

all the states was 15.72 tonnes. (RMRDC, 2005). The annual average production figure for Nigeria was 45.6 metric tonnes of groundnut oil, 713 metric tonnes of Groundnut cake and 2,652 metric tonnes of unshelled groundnut (FAO, 2022) Groundnut oil production (processing) is a way of converting harvested agricultural produce into other forms of products that can be preserved over a long period. Groundnut seeds are converted into groundnut oil and groundnut cake commonly called **"Kuli-Kuli"** in Northern Nigeria. Groundnut oil processing serves as a source of additional income to boost household food security, especially among rural poor dwellers (NAERLS, 2000).

Groundnut seed cleaning, shelling, cooking and oil extraction are the four (4) main processes for commercial large-scale cooking oil production lines. The purpose of cleaning, shelling and cooking is to facilitate oil extraction and improve oil yield and quality.

Cleaning involves the removal of impurities such as stems, leaves, soil, grass seeds, sand, stone, metal, hemp rope, etc. from groundnuts entering the oil plants to ensure the smooth production of groundnut oil.

Drying is necessary if the groundnuts have high moisture content before shelling.

Shelling is done manually through direct labour or automated through a peanut Sheller machine to reduce the absorption of oil by the shell, increase the oil yield, improve the capacity of the processing machine and reduce the wear and tear of the equipment.

Oil is extracted without cooking using a cold-pressing procedure and extracted with cooking using a hot-pressing process.

Screw oil pressing is the most common oil extraction technology for groundnuts with an output of pure national green food, mellow fragrance, long shelf life, solvent residue, soup, and peanut cake of high value and rich in nutritional ingredients.

Oil extraction from groundnut includes cleaning, roasting, de-skinning, kneading and frying. This process is mainly traditional characterized by drudgery and is time-consuming. In Nigeria, groundnut oil accounts for seventeen percent (17%) of total agricultural export earnings. The shortfall in domestic demand is 300,000 to 400,000 metric tonnes (Ojowo, 2004).

Groundnut seeds are nutritional sources of vitamin E, niacin, Flavin, calcium, phosphorus, magnesium, zinc, iron, riboflavin, thiamine and potassium. It is also used as animal feed, raw materials for oil, cake and fertilizers. The multiple uses of the groundnut plant make it an excellent cash crop for domestic markets and foreign trade in several developing and developed countries (Stigter, 2006). Occupational eye injuries and diseases are known to cause severe morbidity and immense economic loss (Ho, 2008).

Unfortunately, workers in oil-producing industries disproportionately suffer the burden of these occupational health problems (Rosenstock *et al*, 2006). In the groundnut oil milling industry, the adult working population is highly exposed to workplace-related hazards such as chemicals, flying insects, dust, hot oil splashes, pollutants from engines, injuries, ultraviolet light and radiation. A combination of factors such as poor working conditions, longer hours at work, inadequate safety precautions and lack of adequate use of personal protective equipment can lead to increased ocular trauma and diseases which may lead to reduced vision and ultimately blindness. However, most of the eye disorders which workers suffer in the course of work can be prevented using proper eye protection such as safety goggles, shields and helmets (Saari, 2001).

Compliance with strict regulations regarding occupational health and safety has led to a decline in work-related accidents in most industrialised economies (Alli, 2008). These regulations are mostly absent in developing economies. Identifying risk factors and estimating the prevalence of occupational

ocular injury is important for the establishment of local and national occupational injury prevention strategies and programs.

Therefore, this study would fill the gap by determining the prevalence and associated factors of occupational ocular injury among workers in the groundnut oil-producing industry at Dakata Sabuwar AU Kano State, Nigeria. The outcome of this study will serve as baseline data for further studies for eye care providers and policymakers to design evidence-based interventions to reduce the burden of blindness and visual impairment from ocular injuries.

Materials and Methods

This study was carried out among workers in the groundnut oil production industry at Dakata Sabuwar AU Kano State situated at Nasarawa local government area in Kano metropolis, Nigeria. The total land area of Kano State is 20,760 square kilometres with a population of 9,383,682 (National Population and Housing Census, 2006).

This research was a prospective study and the aim was to determine the prevalence and associated factors of occupational ocular hazards among workers in the groundnut oil production industry. It was carried out for a period of six months (from February to July 2022).

Instruments used for data collection include a pen torch (Keeler) Batteries (Alkaline) and a Self-Structured Validated Questionnaire. A Pen torch was used for the examination of the ocular structures of the participants and a structured and validated questionnaire was used for face-to-face interview. . Participants were grouped according to age range. Data collected were properly stored for analysis.

Collected data were stored and analysed using the Statistical Package for Social Sciences (SPSS) version 20. Chi-Square was used to test the variables; a P value of (0.000) less than (0.05) was considered statistically significant.(table7.1)

Random sampling technique was employed during participants' selection and Cochran's formula was used to determine the sample size of 200 subjects.

Results were presented in tables and Bar Charts. Ethical approval was obtained from the ethics committee of the Department of Optometry Bayero University Kano and the Health Research Ethics Committee of the Ministry of Health Kano State. Another approval was given by the management of industrial workers for permission to conduct the study.

Results

The total number of participants seen was two hundred (200) (400 eyes) all males. The age range used was Eleven to One Hundred and Twenty Years (11-120) years. The majority of workers (99) (49.5%) are between 20 – 29 years with a mean age of 29.95 ≠9.3.

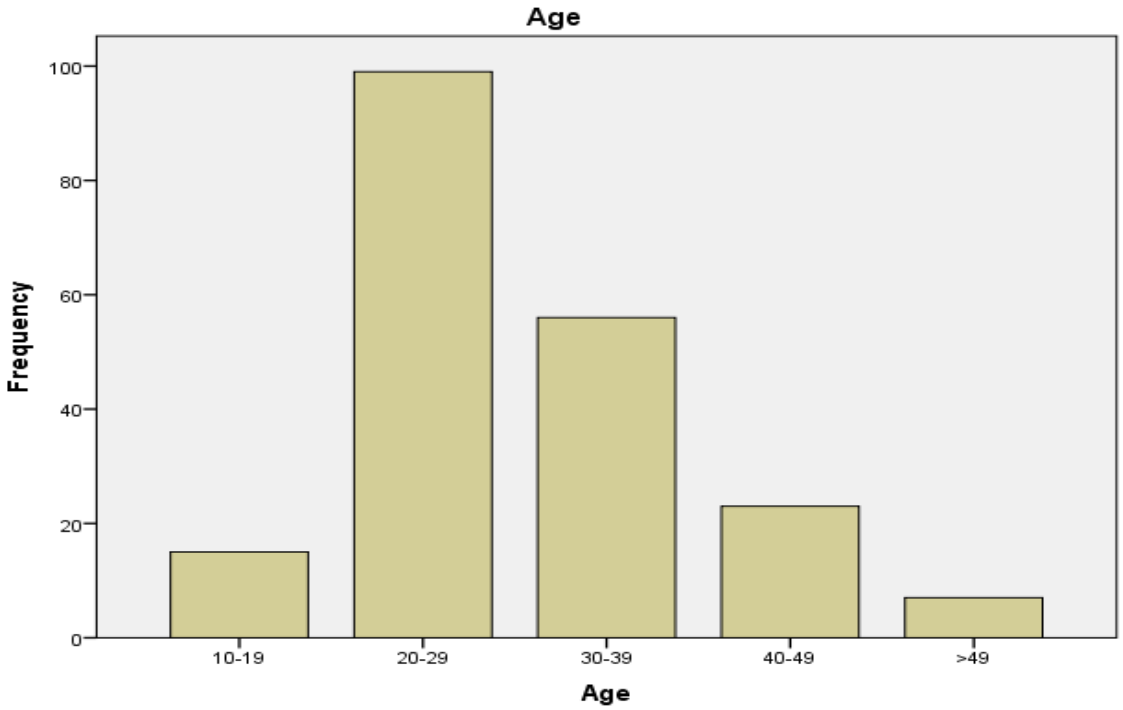

Figure 1: *Age Distribution of the Workers*

Shows the age distribution of study participants Groundnut oil workers of the age range 20 – 29 years had the highest population with 99(49.5%).

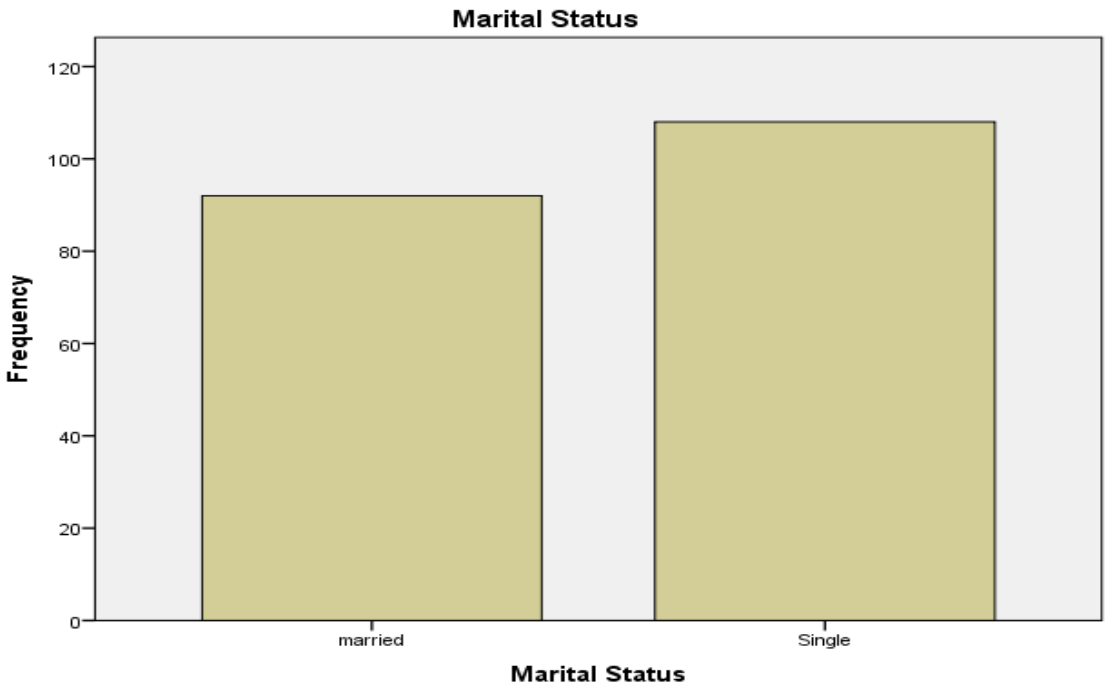

Figure 2: *Marital Status of the Workers*

Shows the distribution of marital status of the study participants. Single workers had the highest frequency 108 (54%) and married workers had the lowest frequency 92 (46%).

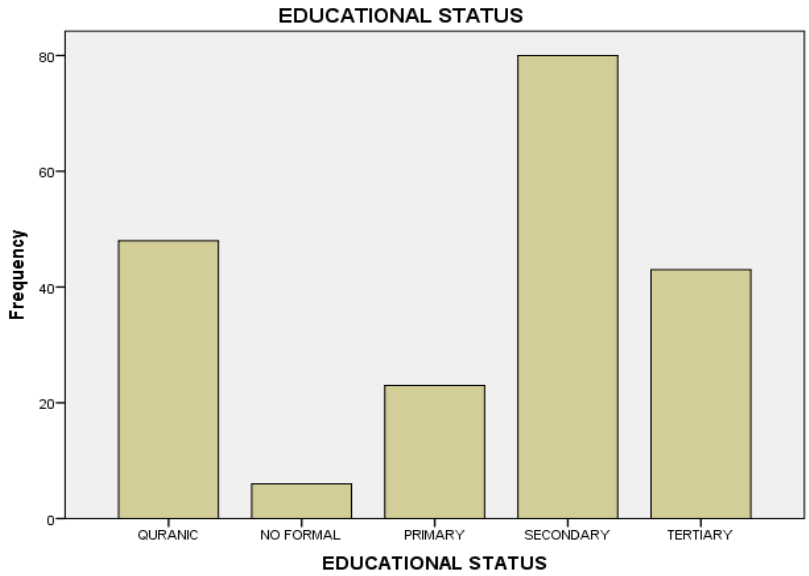

Figure 3: *Educational Status of the Workers*

Shows the Educational Status of the study participants 48 (24%) attended Quranic school, 23 (11.5%) attended Primary school, 80 (40%) attended Secondary school, 43 (21.5%) attended Tertiary school while 6 (3%) had no Formal education.

Table 1: *Man Hours/Week among Workers*

Man Hours (hrs)	Frequency (n)	Percentage (%)
1-10	83	41.5
11-20	47	23.5
21-30	59	29.5
>30	11	5.5
Total	200	100.0

Shows 1 – 10 Man Hours per week 83 (41.5%) had the highest frequency while 21 – 30 Man Hours per week 11 (5.5%) had the lowest frequency.

Table 2: *Distribution of the Number of Years in the Groundnut Industry*

Years	Frequency (n)	Percentage (n)
<3 years	24	12.0
3-6 years	82	41.0
>6	94	47.0
Total	200	100.0

Shows that 94(47.0%) staff worked more than six (6) years hence the highest frequency years of engagement in the groundnut industry.

Table 3: *Distribution of Frequency of Injuries among the Study Participants.*

Injuries	Frequency (n)	Percent (%)
Pterygium	48	24.0
Laceration	40	20.0
Penetrating injury	18	9.0
Others	24	12.0
Blunt trauma	17	8.5
Total	147	73.5

Shows that Pterygium 48 (24.0%) was the most occurring ocular hazard, laceration 40 (20.0%) penetrating injury 18 (9.0%) blunt trauma 17 (8.5%).

Figure 4: *Distribution of Types of Hazards among the Study Participants*

Shows that Groundnut Husk 70 (35.0%) was responsible for the highest cause of ocular hazard, followed by Machinery 40 (20.0%), Sun 37 (18.5%) and Others 53 (26.5%).

Table 4: *Distribution of Awareness and Knowledge of Personal Protective Equipment (PPE) among the Study Participants*

PPEs	Frequency(n)	Percentage(%)
Awareness of one of the PPEs	35	17.5
Awareness of two of the PPEs	70	35.0
Awareness of more than two of the PPEs	90	45.0
Awareness of none of the PPEs	5	2.5
Total	200	100.0

This revealed that workers with awareness of more than two (2) PPEs had the highest frequency 90 (45.0%) followed by workers with awareness of two (2) PPEs 70 (35.0%) while those workers with awareness of only one PPE had 35 (17.5%) and those without awareness of PPE had 5 (2.5%).

Table 5: *Distribution of Personal Protective Equipment use among the Study* Participants

PPEs	Frequency (n)	Percentage (%)
Use of one of the PPEs	52	26.0
Use of two of the PPEs	30	15.0
Use of more than two PPEs	6	3.0
Use of none of the PPEs	112	56.0
Total	200	100.0

This revealed that workers who did not use PPEs had the highest frequency 112 (56.0%) followed by workers who used only one (1) of the PPEs 52 (26.0%), workers who used two (2) PPEs had 30 (15.0%) and those who used more than two (2+) had 6 (3.0%)

Table 6: *Distribution of Personal Protective Equipment Wearability among the Study Participants*

PPEs	Frequency (n)	Percentage (%)
NEVER	110	55.0
SOMETIMES	65	32.5
ALWAYS	25	12.5
Total	200	100.0

Results showed that 25 (12.5%) of workers always wore their PPEs, 65 (32.5%) used their PPEs sometimes and 110 (55.0%) never used PPEs.

Table 7: *Relationship between Man Hours and Ocular Injuries among the Workers*

Injuries * working hours Crosstabulation

Count

		working hours				Total
		1-10	11-20	21-30	> 30	
Injuries	Pterygium	48	0	0	0	48
	Laceration	35	5	0	0	40
	Penetrating injury	0	18	0	0	18
	Others	0	24	0	0	24
	Blunt trauma	0	0	17	0	17
	Normal	0	0	42	11	53
Total		83	47	59	11	200

Table 7.1: *Chi-Square Test of Man Hours and Ocular Injuries*

	Value	Df	P value
Pearson Chi-Square	591.543	24	0.000

Chi-Square (x^2) = 591.543 and P-Value (0.000) less than 0.05, Null Hypothesis (Ho) was rejected with the conclusion that there is a significant relationship between the Man Hours and Ocular Injuries in the Working Population.

Table 8: *Relationship between Years of Engagement and Ocular Injuries among the Workers*

Injuries * Number of years Crosstabulation

Count		Number of years			Total
		<3 Years	3-6 years	> 6	
Injuries	Pterygium	24	24	0	48
	Laceration	0	40	0	40
	Penetrating injury	0	18	0	18
	Others	0	0	24	24
	Blunt trauma	0	0	17	17
	Normal	0	0	53	53
Total		24	82	94	200

Table 8.1: *Chi-Square Test of Years of Engagement in the Groundnut Industry and Ocular Injuries*

	Value	Df	P value
Pearson Chi-Square	477.793	18	0.000

Chi-Square (x^2) = 477.793, Df = 18 and P-value (0.000) less than (0.05). Null Hypothesis (Ho) was rejected with the conclusion that there is a significant relationship between the years of Engagement in the Groundnut oil industry and the ocular injuries in the working population.

Discussion

Worldwide most activities of daily living in the workplace involve the human ocular apparatus therefore exposing the eyes to industrial hazards. This study revealed a prevalence of occupational ocular injury rate of 73.5% among groundnut oil production industry workers at Dakata Sabuwar AU, Nasarawa local government area, Kano State. This is similar to studies carried out in the highly industrialised area of the United Kingdom (UK) by earlier scholars Lambah (1968) and Garrow (1927). This finding is higher than the study conducted in New Zealand with 20.70%, Pandita *et al*., (2001). Benin City, Nigeria 10.70%, Uhumwangho *et al*., (2010). Washington, USA 11.0%, Laura *et al*., (2001) and Scotland 19.60%, Sukati *et al*., (2014). This might be because of the provision of personal protective equipment by employers for workers and the wearability of the safety apparel by employees. Occupational ocular injury of 73.5% in this study was lower than reports from Onyinye *et al*., (2014) with an 84.5% prevalence rate.

The age range of 20-29 years had the majority of workers 99 (49.5%) with a mean age of 29.9 ≠ 9.3. This is not in corroboration with Oyekale *et al*., (2022) studies with the age of 42 years and a mean age of ≠ 8.9.

Single groundnut oil production industry workers108 (54.0%) were the majority contrary to the study done by Emokaro and Ugbekile (2014) which reported that married people primarily operated the oil processing industry in Edo State. This study established that 194 (97%) workers were literate and had some kind of formal education which impacted positively productivity . (Fig). Erhabor and Emokaro (2007) asserted that an educated producer in Edo State produced (13%) more than an uneducated producer. The majority of Workers (47.0%) worked for more than 6 years similar to the theories put out by Karki (2004) and Onyenweaku and Nwosu (2005) that experience and technical efficiency are positively correlated. This implies that more than 6 years of employment is enough time for workers to be exposed to ocular hazards due to frequent exposure and

demonstrates a direct correlation between workplace ocular hazards and the years of engagement. This is in tandem with James' (2015) study reporting workers who stay at their job for less time (less than 5 years) are less likely to have a work-related injury. This study established that Corneal laceration, pterygium, blunt trauma and penetrating injuries are the most common injuries among workers with pterygium being the most prevalent. This corresponds with Isawumi *et al*., (2011) and Erdogan *et al*., (2011) among marble workers, who recognized pterygium and cataracts as two major ocular problems among stone workers. This is due to employers not providing adequate PPEs and the inability of workers to wear PPEs when provision is made. They claim it is not convenient and cumbersome to wear. (Inability to protect the eye will lead to an incident or accident that will lead to disorder; prevention is key)

In the course of this study, some ocular disorders were identified such as pinguecula and conjunctivitis. These may have occurred due to exposure to groundnut husk, pollutants from machines, sun, and outdoor workplaces without proper personal protective equipment. This is contrary to Azuamah *et al*., (2019) study among stone workers in Nigeria that identified itching, irritation, sandy sensation and blurry vision as ocular symptoms. Workers operating without personal protective equipment had the highest frequency with 112 (56%). Kwame, *et al*., (2014), and Jerie *et al*., (2012) agreed with this finding that poor and inappropriate use of personal protective equipment in wood processing industries had the majority. This is in agreement with research conducted by Mitchual, *et al*., (2015).

Conclusion

This research established that the prevalence of ocular hazards among workers in the groundnut oil production industry at Dakata Sabuwar AU Nasarawa Local Government Area, Kano State was 73.5%. The most common ocular hazards and disorders observed were pterygium followed by corneal laceration, penetrating injuries blunt trauma and others. The most prevalent occupational hazards experienced were groundnut husk, machinery, sun, and others (splashes of hot oil into the eye). The study established there was a very low level of awareness and knowledge of occupational ocular hazards and the use of personal protective equipment by employees. These ocular injuries and hazards are avoidable and preventable with employers providing proper personal protective equipment for employees and enforcing wearability through quality, health, safety environment department and promotion of occupational health care.

An unsafe workplace will cause incidents and accidents hence decreasing productivity while a safe work environment reduces the number of near misses and accidents hence increasing productivity. We therefore recommend that employees should undergo pre/post-employment comprehensive eye examination, with adequate provision for eye safety in the workplace and personal protective equipment. Training and retraining in ocular safety should be instituted.

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