

# Occupational hazards and their effect on the health and socio-economic status of local palm oil processors in Delta State, Nigeria

James Bamidele<sup>1</sup>

<sup>1</sup> Department of Community Medicine, College of Medicine, Ekiti State University, Ado-Ekiti, Nigeria

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## Abstract

**Introduction and Objective.** Nigerian rural farmers still use a crude method for farming. The objective of this study is to identify the hazards of traditional palm oil processing in the Ethiope West Community of Delta State, Nigeria, and the associated socio-economic and health consequences on the peasant farmers.

**Materials and Methods.** A cross-sectional analytical study was carried out among the rural palm oil processors. An interviewer administered questionnaire was issued to respondents who were selected using a multi-stage sampling method.

**Results.** 295 respondents participated in the survey; male/female ratio – 4:1. 52.9% had only primary or no formal education; and respondents had spent a median of 4.0 years (IQR: 2.0 to 7.0) in palm oil processing. Spikelet and burn injuries were the hazards faced by most respondents. Hand gloves (48.2%), boots (23.7%), protective wears (22.7%) and helmets (5.4%) were the personal protective equipment reported to be available. As many as 78.0% of respondents had experienced injury while at work, and 22.7% had fallen ill in the past twelve months prior to the study. Those who believed that the occupation was hazardous were about twice as likely to have experienced a work-related injury –  $p > 0.05$ .

**Conclusion.** Rural palm oil processors in the study area are socio-economically poor. They suffer from occupational injuries and illnesses that are directly related to their occupational exposure.

## Key words

traditional palm oil processing, occupational hazards, socio-economic status, health effect

## INTRODUCTION

It is generally agreed that the oil palm originated in the tropical rain forest region of West Africa. The main belt runs through the southern latitudes of Cameroon Co'te d'Ivoire, Ghana, Liberia, Sierra Leone, Togo and Congo [1, 2]. Oil palm is indigenous to the Nigerian coastal plain, having migrated inland as a staple crop [3]. The oil palm is one of the important economic crops in the tropics [4].

The palm oil is a versatile tree crop with almost all parts of the tree being useful and of economic value. The principal product of the oil palm is the palm fruit, which is processed to obtain three commercial products. These include palm oil, palm kernel oil and palm kernel cake. The oil palm tree grows up to 20 meter in height and grows best at temperature of 24–27 °C. It require a humid climate and the cultivated oil palm carry fruit from their fourth year onward and can be harvested for 40–50 years [5].

Crude palm oil (CPO) is obtained from the mesocarp part of the oil palm fruit after undergoing several processes, such as sterilization, stripping, extraction and purification. The oil palm produces two types of oils, palm oil from the fibrous mesocarp and palm kernel oil from the palm kernel. The uses of palm oil are many and varied [6]. Locally, it is used for cooking, making soap, metal plating and as lamp oil. The palm kernel oil, however, is used for making soap, as a source of glycerine, for manufacturing margarine, cooking fats and

for making lubricants. The residue obtained after extraction of the oil is called kernel cake, which is useful in livestock feed production. The crude palm oil (CPO) produced is further processed to yield either red or bleached cooking oil or detergents. The oils are processed from fresh, unbruised fruits, and carefully handled during production, storage and transportation. Palm oil is rich in carotenoids (pigments found in plants and animals) from which it derives its deep red colour; the major component of its glycerides is saturated fatty acid palmitic [2].

The palm oil sub-sector of the agricultural sector of the economy presented itself as a potential productive sector that could be used to diversify the economy because of the numerous economic potentials of palm oil [7]. Ahmed [8] highlighted the importance of the economic tree crop in providing direct employment for about 4 million Nigerians in about 20 oil palm growing states in the country, and to other numerous people involved in its processing and marketing. Agboola [9] was of the opinion that improved technologies that meet both growth and sustainability goals can be effectively used by palm oil processors. Efforts to raise agricultural production and the standard of living of the farmers require the introduction of improved farm equipment and Technologies, as well as increased availability and utilisation of energy and power. However, the great majority of farmers work at near subsistence level of production [10]. Jalani, et al [11] stressed that palm oil processors should embrace a well-integrated capital intensive, high volume and high extraction rate in their processing method in order to encourage the high transformation of the palm oil industry in the country. Unfortunately, the local palm oil processors can hardly afford this.

Address for correspondence: James Bamidele, Department of Community Medicine, College of Medicine, Ekiti State University, Ado-Ekiti, Nigeria  
E-mail: bjobam2004@yahoo.co.uk

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Palm oil production is a common occupation among rural dwellers, but despite agricultural mechanization and the introduction of modern tools and equipment for harvesting and processing agricultural products, most Nigerian rural farmers, and especially palm oil farmers, still use the old and crude method for harvesting and processing palm oil. They are thus exposed to various forms of physical, biological, chemical, mechanical and psychosocial hazards that are inherent in all arts and trades, including palm oil processing. For example, during manual harvesting of the palm fruit bunch, a harvester may fall from the palm tree leading to broken legs or even paralysis; injury may be sustained in the form of particles entering the eyes; the spikelet of the palm fruit bunch may pierce the individual; smoke from the fire made during processing of the crude palm oil may affect the eyes and respiratory system; burn injury may occur during the cooking of the fruits or during threshing if leg chopping is used, and burns from the boiling oil extract during the last stage while attempting to separate the edible oil from its entrained impurities. The study by Christie et al [12] shows that hazard analysis and critical control points (or HACCP) has become an internationally- recognized tool for managing the food safety aspect of production, processing, distribution and preparation of palm oil. It is a preventive programme which identifies, accesses and controls hazards which are significant for food safety. However, to what extent the local/traditional palm oil processors are considered in this type of hazard control analysis remains to be seen since the traditional farmers are often not taken into account in the formulation of most government policies and programmes. Occupational and environmental hazards associated with our traditional industries are hardly considered or discussed to provide improved forms for them.

Oil palm is noted to be one of the major cash crops throughout the length and breadth of Delta State, and the indigenes of Delta State use palm oil as a main soup delicacy, and the peasant farmers also market it as a major source of income.

## OBJECTIVES

It is the objective of this study to assess the effect of the occupational hazards of traditional palm oil processing on the health and socio-economic status of rural palm oil processors in Delta State of Nigeria.

## MATERIALS AND METHOD

A cross-sectional analytical study was carried out among rural farmers who are mainly traditional palm oil processors in the Ethiope West Local Government Area (EWLGA) of Delta State in Nigeria. The area is watered by the Ethiope River and its tributaries; most of the land area is flat and swampy with a dense forest growth. Palm trees are the major economic trees found in every part of the land.

The minimum sample size calculated from the target population was 234 respondents, but a total of 295 respondents were finally interviewed using a pretested semi-structured questionnaire. Administration of the questionnaire was by an interviewer. There was also an observational check list used for the walk-through survey of the work environment

in each of the traditional palm oil processing sites visited. A multistage sampling technique was used. Six of the ten political wards of the EWLGA were selected by the simple random sampling method. In the next stage, each of the palm oil processing sites was taken as a unit, and a cluster sampling of all the available palm oil processors found those who consented to be interviewed in all the six wards. Ethical clearance for the study was obtained from the Ethical Committee of the Delta State University Teaching Hospital, Oghara (DELSUTH), following which a letter of introduction to the Heads of the various communities and wards was given by the Head of the Department of Community Medicine of DELSUTH, Oghara. The researcher and research assistants visited all the wards involved in the survey to carry out community entry and to familiarize themselves with various farmers' associations. The research assistants were resident doctors; medical students and identified indigenes students of the State Polytechnic sited in the LGA who served as local guides.

The questionnaire had been pretested previously among local palm oil processors in Abraka area which is the site of the Delta State University. The questionnaire elicited information on the social demographic characteristics of the respondents, awareness of the hazards of their job, number of years employed, medical history, and whether they had ever suffered any injury while at work, among others. The survey was carried out over a period of three months from January 2010 – March 2010.

Data analysis was carried out using Statistical Package for Social Sciences (SPSS) version 16. Responses were summarized and presented as frequencies. The odds of experiencing work-related injury for different categories of respondents was estimated using the conditional maximum likelihood estimate of the odds ratio and constructed 95% confidence limits around the odds ratio using the mid-P exact method.

## RESULTS

A total of 295 respondents participated in the survey. The majority of respondents (39.3%) were between 21–30 years of age. The male to female ratio was about 4 to 1. About two-thirds of respondents were married and 93.2% were Christians. Urhobo (64.4%), Isoko (19.3%), Ijaw (5.8%) and Itsekiri (3.7%) were the main tribes in the study area. 127 respondents (43.1%) had only primary education and 135 (45.8%) had secondary education (Tab. 1). Respondents had different roles in the traditional palm oil processing activities, ranging from harvesting (34.6%), fruit sorting (42.0%), threshing (43.1%) to extraction (56.6%). About 4 out of every 10 persons interviewed was engaged in palm oil processing on a permanent basis. Farming was the most frequent additional job that non-permanently engaged persons were involved in. 29 respondents (15.8%) were attending school in addition to palm oil processing (Tab. 2). The respondents had spent a median of 4.0 years (IQR: 2.0 to 7.0) in palm oil processing.

When asked about awareness of occupational hazards in their workplace, only 2 respondents (0.7%) provided negative answers. Of those who responded in the affirmative, friends and co-workers accounted for the first source of information for 94.6%. 293 respondents were aware of hazards, of whom the majority – 271 person (91.9%), really considered that

**Table 1.** Baseline characteristics of respondents

n=295	Frequency	%
<b>Age</b>		
11–20	43	14.6
21–30	116	39.3
31–40	90	30.5
41–50	38	12.9
51–60	6	2.0
> 60	2	0.7
<b>Gender</b>		
Male	232	78.6
Female	63	21.4
<b>Marital status</b>		
Married	199	67.5
Single	87	29.5
Divorced	2	0.7
Separated	7	2.4
<b>Religion</b>		
Christian	275	93.2
Islam	1	.3
African tradition religion	14	4.8
Others	5	1.7
<b>Tribe</b>		
Urhobo	190	64.4
Isoko	57	19.3
Ijaw	17	5.8
Itsekiri	11	3.7
Others	20	6.8
<b>Educational status</b>		
None	29	9.8
Primary education	127	43.1
Secondary Education	135	45.7
Tertiary Education	4	1.4
<b>Table 2. Job description in oil processing</b>		
Job description	Frequency	%
Harvesting	102	34.6
Fruit storing	124	42.0
Threshing	127	43.1
Fruit sterilization/cooking	164	55.6
Extraction	167	56.6
<b>Are you permanently employed in oil processing?</b>		
Yes	111	37.6
No	184	62.4
<b>How long have you been in oil processing?</b>		
< 5 years	168	56.9
> 5 years	127	43.1
<b>What other work are you involved in? (n=184)</b>		
Farming	85	46.2
Trading	64	34.8
Civil servant	5	2.7
Artisan	1	0.5
Student	29	15.8

**Table 3.** Awareness of hazards in workplace

	Frequency	%
<b>Are you aware of occupational hazards in your work?</b>		
Yes	293	99.3
No	2	0.7
Total	295	100.0
<b>If yes, what was your first source of information? (n=293)</b>		
School	6	2.0
Friends	159	54.3
Co-workers	118	40.3
Health workers	6	2.0
Others	4	1.4
Total	293	100.0
<b>Do you really believe your occupation is hazardous?</b>		
Yes	271	91.9
No	24	8.1
Total	295	100.0
<b>What are the things that you consider hazardous? (n=271)*</b>		
Spikelet injury	202	74.5
Burn injury	182	67.2
Snake bite injury	82	30.3
Smoke injury	89	32.8
Bee sting injury	68	25.1

\*multiple responses allowed

**Table 4.** Awareness of hazard prevention measures

	Frequency	%
<b>Are there protective measures that can be used to prevent these hazards?</b>		
Yes	243	89.7
No	3	1.1
Don't know	6	2.2
No response	19	7.0
Total	271	100.0
<b>In general terms, how do you think hazards can be prevented? (n=295)*</b>		
Making sure that hazards do not occur at all	282	95.6
Going for treatment when the hazard has already occurred	128	43.4
Reducing hazards to the minimum	178	60.3
Periodic monitoring of your health status	166	56.3
General hygiene of working environment	246	83.4
Use of safety devices, like shoe boots, gloves, overall	264	89.5
Elimination of hazardous agent by substitution with less hazardous ones	87	29.5
<b>Which hazard prevention tools are available for your use?</b>		
Boot	70	23.7
Hand Glove	142	48.2
Helmet	16	5.4
Work clothes/protective wear	67	22.7

\*multiple responses allowed

their occupation was hazardous. Spikelet and burn injuries were reported by most respondents as the real hazards faced (Tab. 3). About 89.7% were aware of preventive measures for reported hazards. Hand gloves (48.2%), boots (23.7%), work clothes/protective wears (22.7%) and helmets (5.4%) were the only personal protective equipment reported as being available (Tab. 4).

**Table 5.** Experience of injury and illness

	Frequency	%
<b>Have you suffered any injury while at work (n=295)</b>		
Yes	230	78.0
No	65	22.0
<b>If yes, what was the cause of injury? (n=230)*</b>		
Spikelet injury	182	79.1
Burn injury	57	24.8
Fall	38	16.5
Cutlass injury	18	7.8
Smoke irritation	111	48.3
Presser injury	14	6.1
Bee sting	13	5.7
Snake bite	2	0.9
<b>Do you think the injury could have been prevented? (n=230)</b>		
Yes	191	83.0
No	39	17.0
<b>Have you suffered any illness/disease in the past 12 months more than once? (n=295)</b>		
Yes	67	22.7
No	228	77.3
<b>If yes, state the conditions suffered from (n=67)</b>		
Cough	16	23.8
Neck pain	5	7.5
Eye Itching	5	7.5
Malaria	35	52.2
Low back pain	6	9.0

\*multiple responses allowed

**Table 6.** Relationship between awareness, duration at work and experience of work-related injury

Yes	Have you suffered any injury while at work?		Total	Odds ratio* (95% CI)**	
	Yes	No			
Are you aware of occupational hazards?	Yes	228 (77.8%)	65 (22.2%)	293 (100.0%)	0.7 (0.0, 11.51)
	No	2 (100.0%)	0 (0.0%)	2 (100.0%)	
Do you really believe your occupation is hazardous?	Yes	213 (78.6%)	58 (21.4%)	271 (100.0%)	1.51 (0.56, 3.76)
	No	17 (70.8%)	7 (29.2%)	24 (100.0%)	
Duration at work	< 5 years	130 (77.4%)	38 (22.6%)	168 (100.0%)	0.92 (0.52, 1.62)
	>5 years	100 (78.7%)	27 (21.3%)	127 (100.0%)	
<b>Total</b>	<b>230 (78.0%)</b>	<b>65 (22.0%)</b>	<b>295 (100.0%)</b>		

\*Conditional maximum likelihood estimate of Odds Ratio

\*\*Mid-P exact

As many as 78.0% of all respondents had experienced an injury while at work, ranging from spikelet injury (79.1%) to snake bites (0.9%). The majority (83.0%) of those who had suffered an injury felt that it could have been prevented. On the contrary, 22.7% had experienced an illness while at work in the past twelve months prior to the study (Tab. 5). The experience of a work-related injury occurred more frequently among those who were aware of the occupational hazards they faced. Those who believed that the occupation was hazardous were about twice more likely to have experienced a work-related injury; while a shorter duration (<5years) at work was associated with fewer experiences of work-related injury. Not All these

estimates, however, were significant, as the confidence intervals included the point of no difference (Tab. 6).

## DISCUSSION

Palm oil is the most important source of vegetable oil of all oil-bearing plants and Has the highest yielding. Palm oil production is a common occupation among rural dwellers. Various steps in the oil processing can be associated with hazards if safety measures are not properly taken. Palm oil processing with the indigenous technology, which is mainly a women's occupation at the village level in Akamili, Nnewi, Anambra State, Nigeria, was assessed with the hazard analysis and critical control points (HACCP) system for food safety and quality. The analysis showed that hazards existed at all stages of the process [13].

The presented study investigated the prevailing occupational hazards and their effects on the socio-economic and health status of traditional palm oil processors in the Ethiopie West Local Government Area of Delta state In Nigeria. The age group of about 40% of the respondents was 21–30 years and might be the reason why more thana half of the respondents have spent less than five years on the job as palm oil processors. There were more males than females (ratio 4:1) who participated in the survey. This is similar to the study among oil palm famers in the Ife area in Osun State, Nigeria, where the majority (79.4%) of respondents were males, while about 21% were females [14]. In the current study, more than half of the respondents had only primary education or no education at all. About 40% are engaged in palm oil processing on a permanent basis. They use bare hands in harvesting, fruit storing, and use leg chopping during threshing, and fruit sterilization/cooking is carried out on fires. These were witnessed during the walk- through survey in most of the palm oil processing sites visited, all of which confirmed the fact that they are peasant farmers who practice manual oil processing because they are poor. This is also corroborated by studies among oil palm processors in the Egbedore and Ife areas of Osun State where the majority of farmers adopted traditional processing methods because they were poor and cannot afford a hand-operated Press. Hence the output at a single processing would always be minimal since it involved only manual labour [14, 15].

Over 60% of the respondents are engaged in other jobs, including farming and trading, because traditional palm oil processing alone could not sustain them and their families. This is different from the findings of the study on palm oil and economic development in Africa [16] which claimed that an average palm oil producer lives well above the poverty line. The difference must have been because the study targeted a few organized private and public holding plantations as against the rural palm oil processors, as in the case of the presented study.

Of those who are aware of hazards of their occupation, over 90% percent have their friends and co-workers as their source of information regarding hazards inherent in palm oil processing. Of this number, nine out of every ten of them consider their occupation as hazardous. Despite the majority being aware of the hazards of their occupation, as many as 78.0% have suffered various forms of injury at work. This means awareness of occupational hazards did not have any relationship with experience of work-related injury. The local palm oil processors in this study mostly experienced spikelet

injury and smoke irritation; other injuries include burns, falls, presser injury, bee stings and snake bites. In a study among palm oil processors in Ghana, cuts (35.0%), burns (33.0%), oil splashes (26.0%) were the major injuries encountered during work [17]. In the current study, further analysis showed that those who believe that the occupation was hazardous were about twice more likely to have experienced a work-related injury. This might be because most of the workers were aware of hazards after they had actually experienced some form of injury. This is exactly at variance with an earlier assertion that all workmen should be told something of the material with which they come into contact, and not left to find it out for themselves – sometimes at the cost of their lives [18]. Also, a shorter duration (<5 years) at work was associated with fewer experiences of work-related injury, meaning that the local palm oil processors in this study are constantly exposed to occupational hazards. Since the majority do not use protective devices, and continue to process palm oil manually.

As many as every nine out of ten respondents agreed that there are protective measures that can be used to prevent the hazards emanating from their job. Also, 95.6%, 83.4% and 89.5% think hazards can be prevented by making sure that hazards do not occur at all, that there should be general hygiene in the work place, and by using safety devices, respectively. However, these assertions do not translate to workers practices, as less than half of the respondents use hand gloves and less than a quarter wear boots and protective wears, respectively.

The walk-through survey of the local palm oil processing sites revealed poor hygiene practices among this group of workers, with open dumping and indiscriminate display of palm fruits and other work materials being the order of the day. Ego [13], in his study, also reported points of microbial infection and contamination with sand particles, rusty and dirty baskets, head pans or wheel barrows, tins, transparent bottles and plastic jars on the floor, dirty mortar/pestles and a generally dirty environment in the palm processing sites surveyed.

The medical histories of the respondents for the twelve months prior to the study revealed that about a quarter of them have suffered illnesses, especially malaria (52.0%) and cough (23.8%). Other illnesses suffered include low back pain (9.0%), neck pain (7.5%) and eye itching (7.5%). A Ghana study also quoted sicknesses often reported as: eye problems (21.5%), breathing problems (17.7%), headache (17.7%), coughing (12.7%) and malaria (10.1%) [17]. Previous studies have reported that low back pain is a prevalent health problem among rural peasant farmers. The reported level of low back pain, although low in this study probably because of focusing on only one group of peasant farmers, further confirms the results of earlier studies of low back pain: 72.4%, 67.1% and 40.0% among farmers in Iju-Odo, South West, Ebubu Community in the south and in another rural community in south-western Nigeria, respectively. [19,20,21] The other illnesses reported confirm that the palm oil processors in this study area also suffer from the common illnesses affecting the general population.

## CONCLUSION

The presented study has revealed that the rural palm oil processors in the study area are socio-economically poor and are engaged in manual palm oil processing using their

bare hand and crude tools. They suffer from various forms of occupational injuries relevant to their trade, and suffer from illnesses directly relating to their occupational exposure, apart from the illnesses suffered by the general population.

It is strongly recommended that local/traditional palm oil processors are considered when implementing any form of hazard control analysis, and be taken into account in the formulation of most government policies and programmes. Occupational and environmental hazards associated with our traditional industries should be considered or discussed to provide an improved form for them.

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