# Knowledge of patent medicine vendors about pharmaceutical waste in Jalingo metropolis, North-Central Nigeria

Abdul-Hakeem O. Abiola,[1] Yusuf A. Idris,[1,2] Ganiyat K. Oyeleke,[3] Aisha T. AbdulKareem[4]

[1]Department of Community Health and Primary Care, College of Medicine, University of Lagos, Surulere, Lagos State, Nigeria. [2]National Agency for Food and Drug Administration and Control, Isolo, Lagos state, Nigeria. [3]Department of Medicine, Lagos University Teaching Hospital, Surulere, Lagos State, Nigeria. [4]Department of Community Health, Lagos University Teaching Hospital, Surulere, Lagos State, Nigeria

Corresponding author: Abdul-Hakeem O. Abiola
Email: aoabi2@gmail.com ; Phone: +2347034868296

**ABSTRACT**

**Background:** Patent Medicine Vendors are individuals without formal pharmacy training that are involved in the retail of medicines. They have potential to generate a large volume of pharmaceutical waste and hence constitute a source of concern if proper pharmaceutical waste management is to be ensured.

**Objective:** To assess the knowledge of pharmaceutical waste management among Patent Medicine Vendors in Jalingo Metropolis, North Central Nigeria.

**Methods:** A descriptive cross-sectional study was conducted in August 2017 among Patent Medicine Vendors in Jalingo City. A pre-tested, structured, interviewer-administered questionnaire was used for data collection. Responses to the knowledge questions were scored and graded as poor (<50%), fair (50-74%) and good (≥75%). Univariate, bivariate and multivariate analyses were carried out. P value ≤ 0.05 was considered statistically significant.

**Results:** Response rate was 81.97%. Age range and mean age of the respondents were 20-61 years and 34.07±9.99 years respectively. Majority of the respondents were males (72.00%). Igbo (31.33%) and Hausa-Fulani (30.67%) ethnic groups dominated the profession. Half (50.0%) of the respondents had good knowledge of pharmaceutical waste management. The mean knowledge score (%) was 73.02±14.33.

**Conclusion:** Patent medicine vending was male and Hausa-Fulani/Igbo ethnic groups dominated. Few of the Patent Medicine Vendors were below the recommended age for Patent Medicine Vendors. Only half of the Patent Medicine Vendors had good knowledge of pharmaceutical waste management. Enforcement of guidelines for Patent Medicine Vendors and continuous training of patent medicine vendors on pharmaceutical waste management are therefore recommended.

**Keywords:** Pharmaceutical Waste Management, Patent Medicine Vendors, knowledge

# Connaissance des déchets pharmaceutiques chez les vendeurs de médicaments brevetés dans la métropole de Jalingo, centre-nord du Nigéria

Abdul-Hakeem O. Abiola,[1*] Yusuf A. Idris,[1,2] Ganiyat K. Oyeleke,[3] Aisha T. AbdulKareem[4]

[1]Département de la santé communautaire et des soins primaires, Collège de médecine, Université de Lagos, Surulere, État de Lagos, Nigéria. [2]Agence nationale pour l'administration et le contrôle des aliments et des drogues, Isolo, État de Lagos, Nigéria. [3] Département de médecine, Centre hospitalier universitaire de Lagos, Surulere, État de Lagos, Nigéria. [4]Département de santé communautaire, Centre hospitalier universitaire de Lagos, Surulere, État de Lagos, Nigéria

* Auteur de correspondance : Abdul-Hakeem O. Abiola

Email: aoabi2@gmail.com ; Téléphone: +2347034868296

**RESUME**

**Contexte :** Les vendeurs de médicaments brevetés sont des personnes sans formation en pharmacie qui sont engagées dans la vente au détail de médicaments. Ils ont le potentiel de générer un grand volume de déchets pharmaceutiques et constituent donc une source d'inquiétude en ce qui concerne la gestion appropriée des déchets pharmaceutiques.

**Objectif :** Évaluer les connaissances en matière de gestion des déchets pharmaceutiques chez les vendeurs de médicaments brevetés dans la métropole de Jalingo, dans le centre-nord du Nigéria.

**Méthodes :** Une étude transversale descriptive a été menée en août 2017 auprès des vendeurs de médicaments brevetés à Jalingo. Un questionnaire pré-testé, structuré et administré par un enquêteur a été utilisé pour la collecte de données. Les réponses aux questions sur les connaissances ont été notées et classées comme mauvaises (<50%), passables (50-74%) et bonnes (≥ 75%). Des analyses uni-variées, bi-variées et multivariées ont été réalisées. Une valeur de $p \leq 0,05$ a été considérée comme statistiquement significative.

**Résultats :** Le taux de réponse était de 81,97%. La tranche d'âge et l'âge moyen des répondants étaient respectivement de 20 à 61 ans et de 34,07±9,99 ans. La majorité des répondants étaient des hommes (72,00%). Les ethnies Igbo (31,33%) et Haoussa-Foulani (30,67%) dominaient la profession. La moitié (50,0%) des répondants avaient une bonne connaissance de la gestion des déchets pharmaceutiques. Le résultat de connaissances moyen (%) était de 73,02±14,33.

**Conclusion :** La distribution de médicaments était dominée par les hommes et les groupes ethniques Haoussa-Foulani / Igbo. Peu de vendeurs de médicaments brevetés avaient moins de l'âge recommandé pour les vendeurs de médicaments brevetés. Seulement la moitié des vendeurs de médicaments brevetés avaient une bonne connaissance de la gestion des déchets pharmaceutiques. L'application des directives pour les vendeurs de médicaments brevetés et la formation continue des vendeurs de médicaments brevetés à la gestion des déchets pharmaceutiques sont donc recommandées.

**Mots-clés** : gestion des déchets pharmaceutiques, vendeurs de médicaments brevetés, connaissances

## INTRODUCTION

Patent Medicine Vendors (PMVs) are a group of individuals involved in the retail of medicines without formal pharmacy training, often motivated by profit-making.[1-3] They are patronized by people from all segments of the community especially the poor because they are perceived to be more accessible, caring, and affordable than public health facilities. They are a source of drugs, advice, and treatment for illnesses in many communities.[4,5]

Many countries, recognizing their role and contribution to ensuring equitable access by the population to essential drugs, permit them to sell certain over-the-counter (OTC) drugs for treatment of common ailments.[6] However, as determined by their financial capability, they sell all types of drugs including those that are outside the scope of their license.[2] In addition, the PMV obtains their drug supplies through both formal and informal channels including large retail and wholesale pharmacies in major cities, direct from pharmaceutical companies, and through visiting company representatives. There are also reports that these drugs may be ineffective, counterfeit or expired.[2]
The activities of PMVs are usually regulated by agencies of government. In Nigeria, Pharmacists Council of Nigeria (PCN) regulates PMVs' activities as established in Pharmacy Council of Nigeria Decree 91 of 1992. PCN specifies eligibility criteria for operating as a PMV, stipulates licensing requirements, and gives guidelines for operators to follow. While PCN regulates the activities of PMVs, drug registration and regulation are within the purview of National Agency for Food and Drug Administration and Control (NAFDAC).[6]

Pharmaceutical waste includes expired, unused, spilt and contaminated pharmaceutical products, prescribed and proprietary drugs, vaccines and sera that are no longer required, and, due to their chemical or biological nature, need to be disposed of carefully.[7]
The category also includes discarded items heavily contaminated during the handling of pharmaceuticals, such as bottles, vials and boxes containing pharmaceutical residues, gloves, masks and connecting tubing.[7]
In general, expired pharmaceuticals do not represent a serious threat to public health or to the environment as long as they are properly disposed. Improper disposal may be hazardous if it leads to contamination of water supplies or local sources used by nearby communities or wildlife. Expired drugs may come into the hands of scavengers and children if a landfill is insecure. Pilfering from a stockpile of waste drugs or during sorting may result in expired drugs being diverted to the market for resale and misuse. Most pharmaceuticals past their expiry date become less efficacious and a few may develop a different adverse drug reaction profile.[8]
Pharmaceutical waste management (PWM) has received little or no attention in Nigeria despite the documented human and environmental health risks associated with pharmaceutical waste. A couple of studies have been carried out on the management of healthcare waste in the formal sector of the Nigerian healthcare system, however little is known on how operators in the informal sector manage healthcare waste including pharmaceutical waste. Therefore, with Patent Medicine Vendors (PMVs) representing a particular group of individuals with the potential to generate a large volume of pharmaceutical waste, this study will establish baseline information on knowledge of pharmaceutical waste management among PMVs. This study was therefore carried out to assess the knowledge of PWM among PMVs in Jalingo Metropolis, North Central Nigeria.

## METHODS

Study location: The study was carried out in Jalingo, a city in North Central Nigeria. Jalingo is the capital of Taraba state and has an estimated population of 118,000.[9] There were 183 registered Patent Medicine Vendors in Jalingo metropolis at the time of the study.
Study design: The study design was a descriptive cross sectional study.

**Study population:** The study population comprised the registered Patent Medicine Vendors in Jalingo metropolis.

**Sample size estimation:** With level of significance of 5%, assumed prevalence of adequate knowledge on pharmaceutical waste management of 50% (since no previous study has been carried out on knowledge of pharmaceutical waste management among Patent Medicine Vendors),[10] degree of accuracy desired of 5%, and assumed response rate of 95%; the sample size of 130 was estimated using the formulae for descriptive cross-sectional study and finite correction factor when target population is less than 10,000. However, all the 183 registered Patent Medicine Vendors in Jalingo metropolis were enrolled into the study.

**Data collection:** A pretested, structured, open and close-ended interviewer-administered questionnaire was used for data collection. The questionnaire was

divided into section A and Section B. Section A focused of on respondents' socio-demographic characteristics such as age, gender, educational qualification, ethnic group, marital status, ownership status, receiving training of pharmaceutical waste management, and years of experience. Section B focused on various aspects of knowledge of pharmaceutical waste management.

**Data analysis:** Data processing, cleaning and analysis were carried out using Microsoft excel spreadsheet, Epi info version 7.2.2.2, GraphPad Instat and Winpepi computer statistical software packages. Each correct response of the respondents to the questions on knowledge of pharmaceutical waste management was scored one (1) mark while each wrong or non-response was scored zero (0) mark. The total score obtained by each respondent was converted to percentage and graded as poor (<50%), fair (50-74%) and good (≥75%). The mean knowledge score (%) of the respondents was also calculated. Univariate, bivariate and Multivariate analyses were carried out. Frequencies and percentages of categorical variables as well as mean and standard deviation of the continuous quantitative variables were computed. Chi-square and Fisher exact tests were used to compare differences between proportions while Analysis of Variance test was used to compare differences among means. Results were presented as frequency distribution tables. P value ≤ 0.05 was considered statistically significant.

**Ethical issues:** Ethical approval for the study was obtained from the Health Research and Ethics Committee of Lagos University Teaching Hospital (LUTH). Approval was also obtained from the Chairman of National Association of Patent and Proprietary Medicines (NAPPMED) Jalingo Local Government and head of National Agency for Food and Drug Administration and Control operations in Taraba state. Verbal informed consent was also obtained from each respondents.

**RESULTS**

A total of 150 out of the183 registered Patent Medicine Vendors in Jalingo metropolis participated in the study giving a response rate of 81.97%.

Socio-demographic and work characteristics of the respondents: The mean age and age range of respondents were 34.07±9.99 years and 20-61 years respectively. Eleven (7.33%) of the respondents were 20 years old; 8 out of the 11 respondents were owners of the drug shop. Majority of the respondents were males (72.00%) and had tertiary education (57.33%). The Igbo (31.33%) and Hausa-Fulani (30.67%) tribes dominated the profession. Majority of the respondents were married (58.67), were owners of the shop (66.00%), did not receive training on pharmaceutical waste management (63.33%) and had been practicing for at most 10years (83.33%) (Table 1).

Table 1: Socio-demographic and work characteristics of the respondents

| Variables, n= 150 | Frequency (%) |
|---|---|
| **Age (in years)** | |
| <21 | 11(7.33) |
| ≥21 | 139(92.67) |
| Mean ±SD = 34.07±9.99 | |
| **Gender** | |
| Male | 108(72.00) |
| Female | 42(28.00) |
| **Highest educational qualification** | |
| None | 7(4.67) |
| Primary school | 15(10.00) |
| Secondary school | 42(28.00) |
| Tertiary institution | 86 (57.33) |
| **Ethnicity** | |
| Hausa/ Fulani | 46(30.67) |
| Igbo | 47(31.33) |
| Yoruba | 15(10.00) |
| Others | 42(28.00) |
| **Marital Status** | |
| Married | 87(58.0) |
| Single | 63(42.00) |
| **Ownership Status** | |
| Employee | 51(3 4.00) |
| Owner | 99(66.00) |
| **Received training on pharmaceutical waste management** | |
| Yes | 55(36.67) |
| No | 95(63.33) |
| **Years of practice** | |
| ≤10 | 125(83.33) |
| >10 | 25(16.67) |
| Mean ±SD= 6.95±5.39 | |
| Minimum, Maximum = 2, 40 | |

**Knowledge of patent medicine vendors:** Half of the respondents had good knowledge of pharmaceutical waste management. The mean knowledge score (%) which is an indication of knowledge of the various aspects of pharmaceutical waste management that were examined was 73.02±14.33. The most common aspect of pharmaceutical waste management which the respondents were aware of was that the purchase of quantities of medicines that are just needed serves to minimize the accumulation of expired or unused medicines140 (93.3%) while the least common aspect of pharmaceutical waste management which the respondents were aware of was that not all wastes generated in the drug shop should be specially handled 36(24.00%) (Table 2).

Table 2: Respondents' Knowledge of Pharmaceutical Waste Management

| **Knowledge of patent medicine vendors , n =150** | **Correct responses Frequency (%)** |
|---|---|
| Purchase of quantities of medicines that are just needed serves to minimize the accumulation of expired or unused medicines. | 140 (93.33) |
| Purchase of drug products with extended shelf life serves to minimize the accumulation of expired or unused medicines | 137 (91.33) |
| Improper disposal of expired, unused and damaged medicines can negatively affect the environment | 134 (89.33) |
| Expired or unused medicines if improperly disposed of can be re-used by scavengers | 130 (86.67) |
| Improper disposal of expired or unused controlled medicines such as "tramadol" can be diverted for illicit use by drug addicts | 123 (82.0) |
| Wastes from expired, unused and damaged medicines or objects contaminated with medicines in the drug shop should be separately collected from other waste types like paper | 120 (80.00) |
| Poisoning in children can result from improper disposal of expired or unused medicines | 109 (72.67) |
| Appropriate means of disposal of expired, unused and damaged medicines or objects contaminated with medicines is to take it to NAFDAC for proper disposal | 99 (66.00) |
| *The inappropriate way of disposal of expired, unused and damaged medicines include:* | |
| Burning in an open field | 97 (64.67) |
| Giving to itinerary scavengers/refuse collectors for disposal | 93 (62.00) |
| Disposal in an open field or dumpsite along with general municipal waste | 92 (61.33) |
| Pharmaceutical Waste include expired, unused and damaged medicines | 75 (50.00) |
| Not all wastes generated in the drug shop should be specially handled | 36(24.00) |
| **Knowledge Grade** | |
| Poor | 11(7.33) |
| Fair | 64(42.67) |
| Good | 75(50.00) |
| | Mean ±SD |
| **Mean knowledge score (%)** | 73.02±14.33 |

There was statistically significant associations (p≤0.050) between the respondents' ethnic group and knowledge of pharmaceutical waste management (Table 3). There was no statistically significant association (p>0.050) between the respondents' gender, educational qualification, Marital status, Ownership status, receiving training on PWM, age, years of practice and knowledge of pharmaceutical waste management (Table 3).

Table 3: Factors affecting knowledge of Pharmaceutical Waste among PMVs in Jalingo metropolis

| | **Knowledge of Pharmaceutical Waste** | | | |
|---|---|---|---|---|
| **Variables** | **Poor, n=11** | **Fair, n =64** | **Good, n=75** | **Statistics & Values** |
| | **Freq (%)** | **Freq (%)** | **Freq (%)** | |
| **Gender** | | | | |
| Male | 9(8.33) | 43(39.82) | 56(51.85) | *P=0.537 |
| Female | 2(4.76) | 21(50.00) | 19(45.24) | |
| **Highest Educational Qualification** | | | | |
| None and Primary school | 2(9.09) | 12(54.55) | 8(36.36) | *P=0.324 |
| Secondary School and Tertiary Institution | 9(7.03) | 52(40.63) | 67(52.34) | |
| **Ethnicity** | | | | |
| Hausa-Fulani and Igbo | 9(9.68) | 46(49.46) | 38(40.86) | *P=0.017 |
| Yoruba and Others | 2(3.51) | 18(31.58) | 37(64.91) | |
| **Marital Status** | | | | |
| Single | 6(9.52) | 32(50.80) | 25(39.68) | *P=0.091 |
| Married | 5(5.75) | 32(36.78) | 50(57.47) | |
| **Ownership Status** | | | | |
| Owner | 5(5.05) | 38(38.38) | 56(56.57) | *P=0.054 |
| Employee | 6(11.77) | 26(50.98) | 19(37.25) | |
| **Received training** | | | | |
| Yes | 0(0.00) | 22(40.00) | 33(60.00) | *P=0.372 |
| No | 1(11.58) | 42(44.21) | 42(44.21) | |
| | Mean ±SD | Mean ±SD | Mean ±SD | |
| Age (years) | 37.36±11.43 | 35.06±10.05 | 32.75±9.64 | p=0.208 (ANOVA) |
| Years of Practice (years) | 9.27±11.14 | 7.13±5.13 | 6.31±4.24 | p=0.183 (ANOVA) |

The dominant ethnic groups (Hausa-Fulani and Igbo) tend to be more educated, more likely to be owners, more likely to have received training on PWM, more likely to be older and more likely to have more years of experience than other ethnic groups (Table 4).

Table 4: Variables associated with ethnicity among PMVs in Jalingo metropolis

| | **Ethnic Group** | | |
|---|---|---|---|
| **Variables** | **Hausa-Fulani & Igbo Freq (%)** | **Others Freq (%)** | **Statistics & P-value** |
| **Highest Educational** | | | |
| **Qualification** | | | |
| None and Primary school | 12(54.55) | 10(45.45) | $X^2$=0.61, df=1, p=0.436 |
| Secondary School and | | | |
| Tertiary Institution | 81(63.28) | 47(36.72) | |
| **Ownership Status** | | | |
| Owner | 65(6 5.66) | 34(34.34) | $X^2$=1.65, df=1, p=0.199 |
| Employee | 28(54.90) | 23(45.10) | |
| **Received training** | | | |
| Yes | 35(63.64) | 20(36.36) | $X^2$=0.10, df=1, p=0.753 |
| No | 58(61.05) | 37(38.95) | |
| | **Mean ± SD** | **Mean ± SD** | |
| Age (years) | 35.33±10.10 | 32.02±9.53 | t=1.99, df=148, p=0.048 |
| Years of Practice (years) | 7.66±6.10 | 5.81±3.75 | t=2.06, df=148, p=0.041 |

**DISCUSSION**

The finding that there were more males (72.00%) than females (28.00%) in this study, is an indication of a male-dominant occupation; this is consistent with the findings in some studies.[1-5,11] In contrast, however, a study in Lagos State, South western Nigeria, showed female predominance.[6] This suggests that male or female dominance depends on the setting where the study is carried out.

The mean age of the PMVs in this study was 34.07±9.99 years and the age range was 20-61years. The mean age in this study is similar to what was obtained in some studies.[2-6,11]

The law regulating PMVs in Nigeria, sets minimum age of 21years as the qualifying age for PMV licensure.[12] The finding in this study that 8 out of the 11 respondents who are less than 21 years old are drug shop owners, is an indication of violation of the law regulating PMVs' operation.

Majority of the respondents in this study had a tertiary education (57.03%); this is similar to the findings in many studies which reported that majority of PMVs had tertiary education and most notably, were health workers with either nursing or community health worker educational background.[1,13] Although some studies showed majority had attained only secondary school level education.[11,6] It is worthy of note that the essential requirement for licensure is primary school education level.[12] More so, higher literacy could suggest that the respondents will be able to fit into any educational training programme that may be organized with the aim of improving their knowledge and quality of practice.

Nigeria is a vast country with varied geographical condition and ethnic groups. The three major ethnic groups in Nigeria are the Hausa, Igbo and Yoruba tribes from Northern, Eastern and Western part of the country respectively.[14] In this study, the predominant ethnic groups were Igbo ethnic group (31.33%) followed by the Hausa-Fulani ethnic group (30.67%). This finding that Igbo ethnic group dominates business of patent medicine vending in Northern Nigeria is consistent with the results of studies on PMVs carried out in Nigeria which revealed that Igbos are more involved than any other ethnic group in the business of patent medicine vending in Nigeria.[6] The finding that Hausa-Fulani is the second largest group in this study is due to the fact that the study was carried out in Hausa-Fulani dominated area.

The finding that majority of the respondents in this study were the drug shop owners is similar to findings of other studies carried out on PMVs.[2,3,5,6,11] The participation of higher proportion of shop owners in this study suggests that responses obtained represent that of decision makers whose opinions and actions matter most on the operations and activities of the drug shop.

The mean duration of practice as PMV in this study was 6.95±5.39 years; this is similar to the findings of a study carried out in Lagos State, South western Nigeria.[6] The short practice duration is an indication that PMVs are associated with high attrition and the fact that many of the drug-shop owners do not practice patent medicine vending as a sole occupation as they may as well be government employees. However, some may practice for a very long time as observed in this study where practice duration of up to 40years was recorded.

Most of the respondents in this study knew that pharmaceutical waste minimization can be achieved through purchase of quantities of medicines that are just needed and purchase of medicines with longer shelf life. Accumulation of pharmaceutical waste has been blamed on poor stock management which often leads to high turnover of expired medicines and the resultant problem associated with managing this waste.[8]

In this study, 82% of the respondents knew that improper disposal of expired or unused controlled medicines such as “tramadol” can be diverted for illicit use by drug addicts, 72.67% of the respondents knew that poisoning in children can result from improper disposal of expired or unused medicines. The PMVs in this study have thus demonstrated a good understanding of the adverse environmental effects, the risks for children poisoning, illegal diversion for illicit use and the potential for recovery and reuse of improperly disposed pharmaceutical waste. This correlates with findings of many studies which showed improved awareness among respondents regarding environmental and public health risks associated with pharmaceutical waste.[15-19] Many of the current efforts and awareness about pharmaceutical waste management stemmed from the discovery of pharmaceuticals in some environmental media and the understanding that pharmaceuticals in the environment impact negatively on organisms living in the environment including man.[20-22]

In this study, 66% of the respondents knew that appropriate means of disposal of expired, unused and damaged medicines or objects contaminated with medicines is to take it to NAFDAC for proper disposal. This is an indication that PMVs recognize the role of the medicine regulatory agency, NAFDAC, in the disposal of

unused and expired medicines in Nigeria. This knowledge is fundamental in ensuring compliance with rules and regulations.

The findings in this study that the inappropriate way of disposal of expired, unused and damaged medicines identified by majority of the respondents include burning in an open field, giving to itinerary scavengers/refuse collectors for disposal and disposal in an open field or dumpsite along with general municipal waste is commendable. Pharmaceutical waste disposal via open field burning, giving out to itinerary waste collectors and dumping in the opened field pose the risk of environmental pollution, diversion for illicit use and recovery for re-use.[7,8,23,24] This suggests that PMVs have the potential to ensure that pharmaceutical wastes are properly disposed of.

Furthermore, this study revealed that 50% of the respondents did not know that wastes of the type constituted by expired, unused or damaged medicines are called "Pharmaceutical waste." This is of concern with regards to awareness creation and in the preparation of information, education and communication materials where the use of unfamiliar terms may impede understanding and assimilation.

Only 24% of the respondents in this study knew that not all waste types generated in the drug shop require special handling. This is of concern as it might affect their capacity to practice waste segregation and to enjoy the advantages conferred by waste segregation in the effective and efficient management of pharmaceutical waste. Waste segregation enables the reduction in the volume of waste which is considered hazardous and requires special handling and by this, also reduces both the effort and resources required in the treatment and disposal of hazardous waste, including pharmaceuticals.[7,8,23]

The finding that there were statistically significant associations ($p<0.050$) between the respondents' ethnic group and knowledge of pharmaceutical waste management might be due to the fact that the dominant ethnic groups (Hausa-Fulani and Igbo) tend to be more educated, more likely to be owners, more likely to have received training on PWM, more likely to be older and more likely to have more years of experience than other ethnic groups (Table 4).

In this study, proportion of PMVs who had good knowledge of PWM was more among those who received training on PWM than those who did not receive training. This relationship was however not statistically significant. This might be due to the fact that the content of the training received did not address all the aspects of PWM that were investigated in this study.

## CONCLUSION

Patent medicine vending is dominated by male gender, Igbo ethnic group and Hausa-Fulani ethnic group in North central Nigeria. Few of the PMVs did not comply with regulations with respect to minimum age of PMV. Only half of the PMVs had good knowledge of pharmaceutical waste management. It is therefore recommended that the Pharmacist Council of Nigeria (PCN) and other regulatory agencies saddled with the responsibility of regulating the operations of PMVs should enforce compliance with regulations, organize continuous training on PWM for PMVs and also incorporate modules on PWM into PMVs' induction.

## ACKNOWLEDGEMENT

The authors' acknowledge with thanks the Patent Medicine Vendors in Jalingo metropolis

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