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Assessing knowledge of hypertension and diabetes mellitus among informal healthcare providers in urban slums in southeastern Nigeria

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Abstract
Informal healthcare providers (IHPs) often serve as the first point of contact for healthcare services for non-communicable diseases in urban slums and their ability to identify risk factors and symptoms of the diseases is crucial for early detection and management. This paper assesses level of knowledge of hypertension and diabetes mellitus (DM) among IHPs. A cross-sectional survey was conducted in eight slums in Enugu and Onitsha cities in south-eastern Nigeria. Data was collected from 238 IHPs including patent medicine vendors, traditional birth attendants, traditional bonesetters, and herbalists. Knowledge scores were computed for each respondent. Adequate knowledge was set at ≥ 50% score and inadequate knowledge at < 50%. Binary logistic regression analysis was used to identify factors/independent variables associated with adequate knowledge among IHPs. Independent variables in the regression model were seven items that describe the profile of IHPs and can influence their access to information on non-communicable diseases. Knowledge of risk factors and symptoms of hypertension and DM among IHPs was low since only 21 (8.82%) and 19 (7.98%) of them had adequate knowledge of hypertension and DM, respectively. In regression analysis, IHPs who had received formal training in the past demonstrated significantly higher levels of knowledge, with odds of adequate knowledge in hypertension being 14.62 times greater for trained providers, and the odds of adequate knowledge of both non-communicable diseases being 21.34 times greater for trained providers. Training of IHPs is needed to address the critical knowledge deficit of risk factors and symptoms of hypertension and DM. This would contribute to better health outcomes and reduced disease burden in urban slums.

Keywords Informal settlements · Knowledge · Non-communicable diseases · Patent medicine vendors · Traditional healers

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1 Introduction

Nigeria, as one of the most populous countries in Africa, faces the daunting task of addressing the healthcare needs of its urban slum populations, especially the twin burden of communicable and non-communicable diseases of which slum dwellers are highly vulnerable [1]. Within these marginalized communities, informal healthcare providers often play a vital role in delivering primary healthcare services, offering a lifeline to residents who lack access to formal medical facilities [2, 3]. Urban slums are areas of concentrated disadvantage, characterized by overcrowding, inadequate access to healthcare facilities, and poor living conditions, that represent a significant global health challenge [4].

Two non-communicable diseases (NCDs), hypertension (HTN) and diabetes mellitus (DM), have emerged as major public health concerns worldwide [5–8] and a significant burden in urban slums. Hence, HTN and DM are no longer limited to affluent urban areas but have penetrated deeply into marginalized slum communities [9–11]. These NCDs are often referred to as "silent killers" due to their asymptomatic nature in the early stages, leading to delayed diagnosis and severe complications.

Urban slums in Nigeria, like many other low-resource settings, face a high burden of HTN and DM [9]. Urban slum dwellers are particularly vulnerable to these diseases due to a complex interplay of socioeconomic factors, including poverty, limited education, and restricted healthcare access [12, 13]. Compounding the problem in urban slums could be the near absence of formal healthcare providers, leading to the proliferation of all types of informal healthcare providers in such areas, with many of them providing inappropriate healthcare services. It is known that urban slums typically lack adequate healthcare infrastructure and resources, including trained healthcare professionals and well-equipped clinics [2, 14, 15].

Informal healthcare providers, including traditional healers, community health workers, and drug vendors, often serve as the first point of contact for healthcare in urban slums [2, 14, 15]. They play a critical role in healthcare delivery due to limited access to formal medical facilities. Although informal healthcare providers fill this gap in healthcare provision, stakeholders have expressed concerns about their limited medical training and knowledge to provide health services of acceptable quality [3]. Their level of knowledge can significantly influence the early detection, management, and referral of these NCDs, and contribute to the health outcomes of patients [16]. Because patients often turn to these providers as their primary source of healthcare advice and treatment, lack of sufficient knowledge can result in misdiagnosis, inappropriate treatment, and delayed referrals to formal healthcare facilities. Therefore, understanding the level of knowledge among informal healthcare providers in urban slums regarding the risk factors and symptoms of HTN and DM is critical.

Previous studies of provider knowledge focus on formal providers, and only a limited body of evidence exists for informal healthcare providers [17–19]. Moreover, available evidence on informal healthcare providers is on knowledge of communicable diseases such as malaria and tuberculosis, and other maternal and child health issues [20–22]. Few studies have focused on knowledge of NCDs more generally [19], and there is no readily available literature on the knowledge of NCDs among informal healthcare providers in urban slums. This underscores the need to assess the knowledge of NCDs among informal healthcare providers in urban slums. A comprehensive assessment of knowledge will contribute to a more nuanced understanding of the challenges and opportunities for improving healthcare delivery and outcomes in the underserved slums. The information will shed light on the extent to which these providers are equipped to identify and educate patients about these NCDs and provide insights into potential areas for targeted interventions and improvements in the healthcare delivery system within these underserved and marginalized communities.

This paper presents new evidence on the knowledge assessment, discusses the implications of the findings, and proposes recommendations for enhancing the capacity of informal healthcare providers to address HTN and DM in urban slums. By doing so, the research contributes evidence that could be used to design interventions for: (i) improving the quality of NCD services in Nigeria's urban slum populations, and accelerating achievement of SDG 11: making cities and human settlements inclusive, safe and sustainable [23]

2 Methods

- Study area and study design

Cross-sectional survey was used to assess the provider's knowledge of risk factors and symptoms of HTN and DM. The study was undertaken in two cities in two southeastern Nigerian states namely, Onitsha in Anambra State and Enugu in Enugu State. A total of eight (8) slums were purposively selected from both cities considering the relative size of the slum and the availability of functional primary health center (PHC) within the slum. Areas with security challenges were avoided—only one slum in Enugu city that met the inclusion criteria was avoided due to insecurity.

Based on the 2006 census and an estimated annual growth rate of 2.83%, Anambra State's population was projected at 5.6 million and Enugu at about 4.4 million as of 2019 [24]. Administratively, Anambra and Enugu States have 21 and 17 local Government Areas respectively. Urban dwellers in both states are mostly civil servants, traders, transporters, or artisans.

- Study population and Sample

This is part of a larger study that involved informal providers in the selected urban slums and formal providers in primary health centres that serve the slums. For this paper, we extracted and analyzed data for informal healthcare providers within the slums and they included patent medicine vendors, traditional birth attendants, traditional bone setters and herbalists/traditional healers, only. Spiritualists and those that practice all forms of exorcism were excluded from the analysis. In each IHP practice place, the most senior person was targeted for the survey, and in their absence, a representative was interviewed, preferably the next in seniority. The characteristics of the facilities from which the informal providers were sampled and surveyed are attached as a supplementary file.

A sample size of 256 healthcare providers (including formal and informal providers) was determined using the guidelines outlined in the demographic and health survey (DHS) listing manual (2012). Sample sizes for DHS surveys are determined by the number of survey domains (typically subnational units like regions) and the precision requirements for key indicators, with designs aimed at providing estimates with a reasonable relative standard error.

Of the 256 healthcare providers in the survey, 238 were informal providers. All eligible informal healthcare providers that consented to the survey were interviewed in each slum and their data were analyzed for this paper.

- Data collection and analysis

Data was collected using a pre-tested interviewer-administered structured questionnaire that was developed specifically for the study.

Information on the characteristics of the providers was collected, as well as their knowledge of the risk factors and symptoms HTN and DM. The survey participants were asked to list as many risk factors as possible and symptoms of HTN and DM that they know, and their responses were recorded on the questionnaire.

Univariate analyses of the providers' characteristics were computed using means for discrete variable (duration/length of formal education) and frequency distributions for categorical variables (including status of respondent in facility, type of provider, access to formal training, registration with government agency, and other provider characteristics that are listed in Table 1). All the responses to the knowledge questions were also computed using frequencies and proportions.

Knowledge of HTN was determined by the respondent's ability to mention 3 common risk factors (overweight, lack of exercise, mental stress) and four common symptoms (severe headaches, difficulty breathing, dizziness, and vomiting). Knowledge of DM was determined by the ability to mention five common risk factors (overweight, lack of exercise, excessive consumption of sugary foods/drinks, excessive consumption of alcohol, heredity) and four common symptoms (weight loss, frequent urination, frequent thirst, fatigue). A score of 1 was given for each correct response and the maximum achievable scores were seven for HTN and nine for DM.

Total knowledge scores for HTN and DM were calculated for each respondent, and this was used to generate mean and percentage knowledge scores for HTN and DM. A cut-off mark of 50% was set to determine the levels of knowledge of HTN and DM among the IHPs. A knowledge score of less than 50% was considered inadequate knowledge, while a score of ≥ 50% was considered adequate knowledge. Although a higher cut off was used to describe adequate knowledge in a similar study [19], the authors deemed it appropriate to use 50% cut off since this study involved informal healthcare workers who typically have no formal training from recognized health institutions.

Binary logistic regression analysis was used to identify the factors that predict adequate knowledge of risk factors and symptoms of hypertension and diabetes mellitus among the IHPs. BLR was deemed appropriate because the dependent variable (level of knowledge) has binary outcomes. The dependent variables were the levels of knowledge of hypertension and diabetes mellitus—that is adequate knowledge '1' and inadequate knowledge '0'. The independent

Table 1 Characteristics of the informal health providers in the survey

Variables	Frequency (%)
Formal education	
Yes	182 (76.47)
No	56 (23.53)
Mean (SD) length of formal education = 13.42 (± 10.91) years	
Provides 24-h service	
Yes	40 (16.81)
No	142 (59.66)
Missing response	56 (23.53)
Status of respondent in the facility	
Head of facility	201 (84.45)
Representative of head of facility	37 (15.55)
Type of informal health provider	
Patent medicine vendor	145 (60.92)
Herbalist (Herbal home)	41 (17.23)
Traditional bone setter	19 (7.98)
Nursing/maternity home (traditional birth attendants)	15 (6.30)
Others[a]	18 (7.56)
Received any formal training for health workers in the past	
Yes	182 (76.47)
No	56 (23.53)
Registered with any government or regulatory agency	
Yes	90 (37.82)
No	148 (62.18)
Regularity of inspection by government agency	
Never	115 (48.32)
Once a year	64 (26.89)
Twice a year	50 (21.01)
Quarterly	4 (1.68)
Monthly	4 (1.68)
Registered with any professional association	
Yes	166 (69.75)
No	72 (30.25)

[a]Other types of IHP include diagnostic centers itinerant drug sellers and those with mixed practice (N-238)

variables were provider characteristics including training status, registration with government agency or professional group, regularity of facility inspection by government agency, operation of 24-h service, and provider type. Regularity of inspection was a nominal variable while the other independent variables were binary variables.

The accuracy of the logistic regression model was tested using the probability of obtaining the chi-square statistic if there is in fact no effect of the independent variable on the dependent variable (Prob > chi2).

3 Results

Table 1 shows the characteristics of the 238 IHPs that participated in the survey. A total of 60.92% of them were patent medicine vendors. Over three-quarters of them (76.47%) were trained as IHPs, and 69.75% were registered with a professional association. Majority of the respondents were the heads of the facilities (84.45%).

The results of participants' knowledge of the risk factors and symptoms of HTN are presented in Table 2. It shows that 82.35% of the IHPs were able to identify mental stress as a risk factor of HTN but only 8.82% and 2.52% of them identified lack of exercise and overweight, respectively. However, 15.97% of them were unable to identify any risk factor

Table 2 Knowledge of the risk factors and symptoms of HTN among IHPs in the survey

Knowledge variables	Frequency (%)
Risk factors for HTN	
Mental stress[a]	196 (82.35)
Lack of exercise[a]	21 (8.82)
Overweight[a]	6 (2.52)
Lack of sanitation	10 (4.20)
Others (age, heredity, poverty, overthinking)	18 (10.92)
Don't know	38 (15.97)
Symptoms of HTN	
Headache[a]	144 (60.50)
Fainting/dizziness[a]	84 (35.29)
Difficulty breathing[a]	63 (26.47)
Vomiting[a]	3 (1.26)
Fatigue	87 (36.55)
Fever	21 (8.82)
Convulsions	3 (1.26)
Loss of appetite	2 (0.84)
Others (insomnia, chest pain, confusion)[a]	29 (12.18)
Don't know	39 (16.39)

[a]Correct responses N-238

and 4.2% held the misconception that lack of sanitation is a risk factor of HTN. Also, 60.50% of the IHPs corrected identified headache, 35.29% correctly identified dizziness, 26.47% correctly identified difficulty in breathing, and only 1.26% identified vomiting as a symptom of HTN. Over one-thirds of the IHPs held misconception that fatigue is a symptom of HTN (36.55%), and 8.82% held the misconception that fever is a symptom.

Table 3 shows that 81.93% of the IHPs correctly identified excessive consumption of sugary foods/drinks and 37.82% identified heredity as risk factors of DM. Very small proportions of the IHPs identified excessive consumption of alcohol (13.45%), overweight (5.46%) and lack of exercise (2.52%) as risk factors. On the symptoms of DM, 60.92% correctly identified frequent urination as a symptom, but only 11.76% identified frequent thirst as a common symptom. 2.94% of the IHPs held misconceptions that anaemia and headache are symptoms of DM, and 12.18% of them did not know any symptom of DM.

Table 4 shows that the mean knowledge score for the risk factors and symptoms of HTN was 2.56 (1.52) and for DM was 2.17 (1.20). The proportions of IHPs with adequate knowledge of HTN and DM were 8.82% and 7.98%, respectively.

The results of the binary logistic regression analysis showed that the only independent (predictor) variable with statistical significance is "Received any formal training for health workers in the past". The effects of all other variables had no statistical significance (Table 5).

The odds of adequate knowledge in HTN is 14.62 times greater for providers who had received any formal training for health workers, and the odds of adequate knowledge of both NCDs is 21.34 times greater for the trained providers. The models used to predict adequate knowledge of HTN and adequate knowledge of both NCDs were significant, Prob > chi2 = 0.0418 for HTN and Prob > chi2 = 0.0068 for NCDs (Table 5).

There were no significant predictors of adequate knowledge of DM among the independent variables in the logistic model. The overall model used to predict knowledge of DM was not significant Prob > chi2 = 0.2806.

4 Discussion

The findings show that the knowledge deficiencies of informal healthcare providers about HTN and DM, provides empirical evidence to support recommendations for health education initiatives aimed at improving the knowledge and awareness of informal healthcare providers regarding HTN and DM. This stems from the findings that informal healthcare providers mostly do not have adequate knowledge of the risk factors and symptoms of hypertension and diabetes mellitus. Knowledge deficiencies and misconceptions about risk factors and symptoms of diseases have been

Table 3 Knowledge of the risk factors and symptoms of DM among IHPs in the survey

Knowledge variables	Frequency (%)
Risk factors for DM	
Excessive consumption of sugary foods/drinks[a]	195 (81.93)
Heredity[a]	90 (37.82)
Excessive consumption of alcohol[a]	32 (13.45)
Overweight[a]	13 (5.46)
Lack of exercise[a]	6 (2.52)
Others (age, eating late at night)	5 (2.10)
Don't know	34 (14.29)
Symptoms of DM	
Frequent urination[a]	145 (60.92)
Fatigue[a]	52 (21.85)
Weight loss[a]	48 (20.17)
Frequent thirst[a]	28 (11.76)
Fainting attack	8 (3.36)
Headache	7 (2.94)
Anemia	7 (2.94)
Fever	4 (1.68)
Loss of appetite	3 (1.26)
Vomiting	1 (0.42)
Others (oedema, excessive sweating, blurred vision, delayed wound healing*)	20 (8.40)
Don't know	29 (12.18)

[a]Correct responses

Table 4 Mean knowledge scores and levels of knowledge of hypertension and diabetes mellitus among IHPs in the survey

Non-communicable diseases	Mean knowledge score (SD)	Level of knowledge; n(%)	
		Adequate (≥ 50%)	Inadequate (< 50%)
Hypertension (/9)	2.56 (1.52)	21 (8.82)	217 (91.18)
Diabetes mellitus (/7)	2.17 (1.20)	19 (7.98)	219 (92.02)
Both (DM + Hypertension) /16	4.73 (2.47)	22 (9.24)	216 (90.76)

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consistently stated in literature [19, 25]. Informal providers, who often lack formal medical training, may hold inaccurate beliefs about various health conditions [26, 27]. And these could also lead to misdiagnosis, inappropriate treatment, and the promotion of ineffective or harmful remedies, all of which can adversely affect the health outcomes of patients. These misconceptions could reflect low health literacy levels among informal healthcare providers, regarding their understanding of medical terminologies and concepts [28]. They could also stem from cultural beliefs and local practices [28]. Hence, the importance of considering cultural factors and local contexts when designing healthcare interventions and education programs for informal providers.

The finding that informal healthcare providers who have received training are significantly more likely to have adequate knowledge of hypertension and diabetes mellitus have important implications and can be related to existing literature. However, it is worth emphasizing that despite the fact that 23% of them had received training, less than 10% had adequate knowledge. This underscores the need for retraining schedules that can help to reinforce learning among informal healthcare providers. There is also the need for tailored interventions to address misconceptions, improve health literacy, and enhance the quality of healthcare delivered by informal providers. A common theme in the existing literature suggests that training and education have a substantial positive impact on the knowledge and practices of informal healthcare providers [29–32].

Previous research has shown that formal training programs can enhance the competence of informal providers in correctly recognizing the symptoms of common illnesses and making appropriate referrals [30, 33]. This is also consistent with the Community Health Worker (CHW) model which has shown in many contexts that trained lay health workers

Table 5 Binary logistic regression of factors that influence level of knowledge of hypertension and diabetes mellitus among informal health providers

Independent variables	Unadjusted OR (95% CI)		
	Hypertension	Diabetes Mellitus	Both NCDs
Status in the facility			
Head of facility	1	1	1
Representative of head	0.878 (.162–2.446)	1.092 (.507–7.85)	0.978 (0.303–3.156)
Received any formal training for health workers in the past			
No	1	1	1
Yes	14.620 (1.521–137.43)*	1.703 (.477–6.071)	21.339 (.943–54.58)**
Provider type (Patent medicine vendor)			
Yes	1	1	1
No	0.237 (.081–0.864)	1.380 (.373–5.103)	0.192 (.262–1.401)
Provides 24-h service			
No	1	1	1
Yes	0.387 (.085–1.751)	0.177 (.022–1.366)	1
Registered with government or regulatory agency			
No	1	1	1
Yes	1.013 (.403–2.548)	0.742 (.271–2.026)	0.934 (.375–2.322)
Regularity of inspection by government agency			
Once a year	1	1	1
Never	1.137 (.405–3.191)	1.602 (.488–5.254)	1.764 (.545–5.718)
Twice a year	0.63 (.149–2.658)	1.333 (.316–5.621)	2.093 (.557–7.869)
Registered with any professional association			
Yes	1	1	1
No	0.843 (0.403–2.786)	1.358 (.831–2.219)	0.968 (.140–6.683)

*$p < 0.05$ **$p < 0.01$

play a vital role in bridging the gap between formal healthcare systems and underserved communities [34–36]. Hence, investing in training programs for informal healthcare providers could be a cost-effective strategy to improve knowledge and care quality related to NCDs.

4.1 Study limitations

The findings have limited generalizability beyond the specific urban slums in south-eastern Nigeria where the study was conducted. Variations in healthcare infrastructure, cultural factors, and socioeconomic conditions in other regions of Nigeria may influence knowledge and/or practice differently. A more comprehensive assessment will involve collecting and analyzing data from other regions of the country. Also, the knowledge assessment questionnaire can be further improved to capture additional options for symptoms and risk factors.

5 Conclusions

The findings from this study have revealed that the level of knowledge regarding the risk factors and symptoms of both HTN and DM among informal healthcare providers is inadequate. The deficiency identified has far-reaching implications for the health and well-being of the urban slum populations they serve. Moreover, the study underscores the pivotal role of training and education in addressing these knowledge deficits. Informal healthcare providers who have undergone training exhibited significantly higher levels of knowledge regarding HTN. In the case of DM, training emerges as the key determinant of adequate knowledge. Hence, emphasizing the transformative impact of training interventions to achieving improved knowledge of NCDs among informal healthcare providers.

This emphasizes the importance of expanding training programs and capacity-building initiatives to bridge the existing knowledge gaps amongst informal healthcare providers. This will help to reduce the burden of NCDs, enhance early detection and management, and ultimately improve the overall health and well-being (i.e. SDG-3) of the urban

slum populations in Nigeria. The interventions can be integrated into urban renewal programs that prioritize access to basic services, safe and affordable housing, and green spaces for all.

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Data availability The data that support the findings of this study are available from Health Policy Research Group (HPRG), University of Nigeria, but restrictions apply to the availability of these data and so are not publicly available. The data are, however, available from the corresponding author, Chinyere Ojiugo Mbachu, upon reasonable request and with the permission of HPRG.

Declarations

Ethics approvals and content to participate The authors confirm that the research was performed in accordance with the Declaration of Helsinki. Ethical approval for the study was obtained from University of Leeds School of Medicine Research Ethics Committee (MREC 21–009) and the Health Research Ethics Committee of University of Nigeria Teaching Hospital Enugu (NHREC/05/01/2008B-FWA00002458-1RB00002323). Written informed consent to participate in the study was obtained from all participants before the questionnaires were administered. Participation was voluntary, and all participants were informed of the purpose of the study and their roles and rights, including that they could withdraw their participation at any time during data collection and before data analysis commences.

Consent to publications Informed consent was obtained from all individual participants included in the study.

Competing interests The authors have no competing interests to declare that are relevant to the content of this article.

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