

International Archives of Medical and Health Research

Volume 2, Issue 2, 2021



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Comparative assessment of motor function in children with spastic cerebral palsy subjected to two modalities of physiotherapy

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ABSTRACT

Background: Cerebral palsy (CP) is one of the most common disorders in patients presenting to Paediatric Neurology Clinics in Nigeria with most of them being spastic CP cases. **Aim:** This study aimed to do a comparative assessment of motor function in children with spastic cerebral palsy subjected to two modalities of physiotherapy. **Materials and Methods:** This was a two-group randomized-subjects pretest-posttest study among 170 children with spastic cerebral palsy attending the Paediatric Neurology Clinic of Usmanu Danfodio University Teaching Hospital (UDUTH), Sokoto, Nigeria. They were selected by universal sampling and randomized into continuous and intermittent physiotherapy treatment groups. Assessment of spasticity and motor function was done in the respective groups at baseline (together with questionnaire administration), and after 12 weeks and 24 weeks of treatment using the MAS and the GMFM-88 scales. **Results:** Spasticity reduced steadily in the two treatment groups at 3 and 6 months of therapy, and the proportion of participants with severe spasticity reduced significantly from 36.5% and 40.0% at baseline in the continuous and intermittent groups respectively to 5.9% at 6 months of treatment in both groups. Also, there was a steady increase in motor function at 3 months and 6 months with a significant increase in motor function at 6 months as compared to baseline in both groups. There was no significant difference ($p > 0.05$) between the two treatment groups with regard to reduction in spasticity and improvement in motor function. **Conclusion:** This study shows that there is no significant difference between continuous and intermittent physiotherapy in terms of reduction in spasticity and improvement in motor function. This gives healthcare providers the option of tailoring the choice of therapy to what is more convenient for the patients and their caregivers.

Keywords: Motor function, spastic cerebral palsy, physiotherapy, children

INTRODUCTION

Cerebral palsy (CP) is one of the most common disorders in patients presenting to Paediatric Neurology Clinics in Nigeria and worldwide¹. The prevalence of CP world-wide is estimated to be 2/1000 live births.² A study conducted in Port Harcourt, Nigeria, reported that 834 (36.45%) of the 2,288 patients with neurological problems that were seen over a period of 2 years were spastic CP cases.³ Another study conducted in Sagamu reported that 92 (50.3%) of the 183 patients with neurological problems that were seen over a period of 6 years were spastic CP cases.⁴ Whereas, spastic CP is majorly associated with brain infections (i.e., meningitis, encephalitis, cerebral malaria) in India,⁵ in Nigeria, poor obstetric care, central nervous system infections and other preventable causes like malnutrition, prematurity and low birth weight contribute majorly to the etiology of CP.^{6,7} Birth asphyxia ranks the highest followed by

kernicterus and then central nervous system infection in studies conducted in Ibadan and Zaria.^{8,9} Children are disproportionately affected and face an added burden of poverty, inadequate health facilities, stigmatization and lack of facilities for rehabilitative care.¹⁰

Spasticity causes participation restrictions in a child's home, school and community.¹¹ It is a major cause of disability in childhood with a greater burden in under-developed countries, and with enormous physical, social and economic costs. It occurs early in life, therefore parents, care givers and patients need the best management options to improve the quality of life of these patients.¹² For decades, comprehensive and effective physical rehabilitation has been the main intervention used to minimize spasticity, although physical recovery is rarely complete even with the best rehabilitation.^{4,13} Physical therapy helps to promote,

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Received: 13-09-2021

Revised: 20-10-2021

Accepted: 07-11-2021

Published: 30-12-2021

maintain and restore physical, psychological and social well-being. It also prevents deformities and delays surgical intervention leading to patient's optimal function and effective living.¹⁴

Over the years two major physical therapy regimens have emerged. These include the conventional therapy in which involves once or twice per week physiotherapy, and intermittent intensive therapy in which patients are offered 4 physiotherapy sessions per week over a period of 24 weeks, and with each physiotherapy session lasting for 45 minutes.¹⁵ Studies have been carried out all over the world on the effect of these different modalities of physiotherapy (conventional and intermittent) on improving motor function in cerebral palsy patients.¹⁶⁻¹⁸

However, the effects of the two modalities remain controversial. While Christiansen et al. and Bower et al. observed that intermittent therapy was not superior to the conventional therapy,^{15,19} Trahan and Malouin had a contrary view, as they concluded that intermittent physiotherapy led to more marked improvement in the motor function of the patients.²⁰ The aim of this study is to conduct a comparative assessment of motor function in children with spastic cerebral palsy using two modalities of physiotherapy (conventional and intermittent intensive) in order to determine which modality best improves patients' gross motor function. The findings of the study would guide healthcare providers in the choice of the appropriate treatment modality for patients with spastic CP.

MATERIALS AND METHODS

Study Design and Population

This was a two-group randomized-subjects pretest-posttest study among children with spastic cerebral palsy attending the Paediatric Neurology Clinic of Usmanu Danfodio University Teaching Hospital (UDUTH), Sokoto, Nigeria. The hospital is a tertiary healthcare facility that serves the residents of Sokoto State and the neighboring states including Zamfara, Kebbi and Katsina. The neurology clinic runs weekly where an average of 20 old cases and 5-7 new cases are seen on every clinic day of which 1-2 may be cases of cerebral palsy.

Multidisciplinary specialized care is usually provided for the patients by a team that comprised paediatric neurologists, physiotherapists, ophthalmologists and orthopaedic surgeons. Children aged 2-15 years who were newly diagnosed of spastic cerebral palsy (spastic monoplegic, spastic diplegic, spastic hemiplegic and

spastic quadriplegic) attending the Paediatric Neurology Clinic of the hospital, and whose parents consented to the study or gave assent to participate in the study (i.e., those who were aged ≥ 7 years) were considered eligible and enrolled into the study. Those who have previously been attending the neurology clinic but have never had physiotherapy were also considered eligible to participate in the study. Those with spastic cerebral palsy who were already on anti-convulsants or other muscle-relaxant drugs, those with other forms of cerebral palsy other than spastic cerebral palsy, those with spastic CP who have undergone cerebral palsy related orthopaedic surgery,²¹ those with spastic cerebral palsy with fixed contractures, and those with acute febrile illnesses or diarrhoea related illnesses at the time of assessment,¹¹ were excluded.

Sample Size Estimation and Sampling Technique

The sample size was estimated at 76 participants per group using the formula for comparing proportions in an experimental study,²² an 83.5% prevalence of motor dysfunction among spastic cerebral palsy patients in a previous study,¹ and a 20% projected reduction in motor dysfunction post intervention. Eighty-five eligible study participants were enrolled per group in anticipation of a 10% attrition rate, and they were selected by universal sampling (i.e., every eligible patient whose parent/guardian consented to the study was enrolled into the study until the required sample size was obtained in view of the limited number of patients that are seen weekly).

Data Collection

An interviewer administered questionnaire was adapted from the instrument used in previous studies^{1,9} and used to obtain information on the socio-demographic and clinical characteristic of the study participants. Participants also had physical examination done, and this comprised assessment of muscle tone, muscle power, active and passive range of motion of joints, sensation, deep tendon reflexes, station (pelvic and leg alignment while standing, if there is a possibility), presence of upper and lower limbs' deformity, spinal alignment and gait.

The patients were randomized into 2 treatment groups by block randomization (Figure 1). The treatment groups were based on the modality of treatment as follows:

- Continuous group: This group received the conventional once a week physiotherapy regimen for 24 weeks without a pause.¹⁹

- Intermittent group: This group received an intensive physiotherapy phase (i.e., 4 sessions per week for 4 weeks) followed by a period of pause for 6 weeks, and then the sequence is repeated again, thus making a total of 24 weeks.¹⁵

A baseline assessment was done using the Modified Ashworth Scale (MAS)⁶⁴ and the Gross Motor Function Measure-88 (GMFM_88)^{23,24} at the onset of the study. The outcomes were also measured subsequently at 12 weeks and at 24 weeks using the MAS and the GMFM-88 scales.^{15,25,26} A pilot study was conducted on 10 patients two weeks before the onset of the study to reach an agreement about the scoring of MAS. This included the positioning of patient, speed of movement, number of movements per joint by the examiner. Independent assessments were made by two physiotherapists and the inter-rater reliability revealed strong correlation between the two examiners ($r = 0.719$, $p = 0.019$). Also, for GMFM-88, an independent assessment was made by two physiotherapists and the inter-rater reliability also showed strong correlation between the two examiners ($r = 0.990$, $p = 0.001$). Disagreements concerning the use of MAS and GMFM-88 were clarified with the physiotherapists.¹⁵

Data Analysis

Data were processed using the IBM Statistical Package for the Social Sciences (SPSS) version 21. Quantitative variables were summarized using means and standard deviations, while qualitative variables were summarized using frequencies and percentages. The Chi-square test was used to test for difference in proportions between the two treatment groups at baseline. The independent T test was used to test for significant differences in the means of the MAS and GMFM-88 scores in the two groups at pre- and post-intervention, while the repeated measures analysis of variance (ANOVA) was used to test for significant differences in the means of the MAS and GMFM scores in each of the respective groups at baseline, 12 weeks and 24 weeks. All levels of statistical significance were set at $p < 0.05$.

Ethical Consideration

Ethical clearance for the study was obtained from the Research and Ethics committee of the Usmanu Danfodiyo University Teaching Hospital (UDUTH), Sokoto, Nigeria. Permission to conduct the study was obtained from the management of the hospital, while informed written consent was obtained from the parents and caregivers. In addition to consent from parents and guardians, assent was also obtained from children that were aged ≥ 7 years.

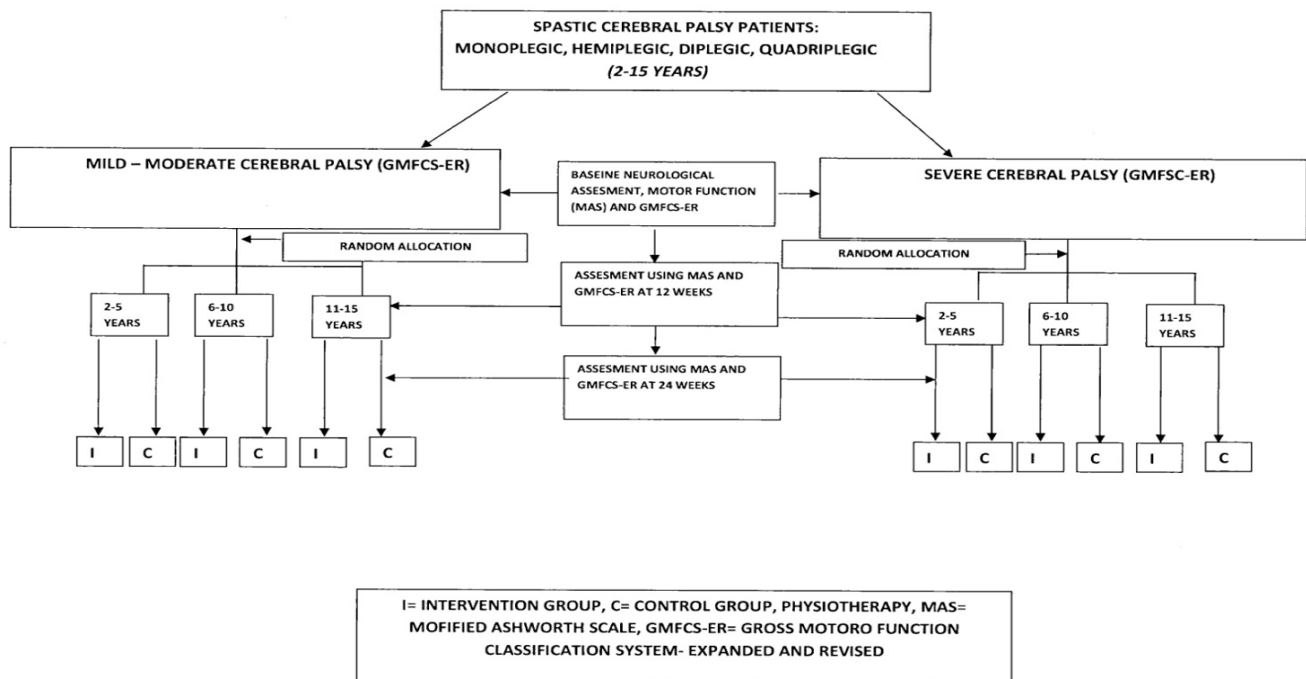


Figure 1: Skeletal framework of the study

RESULTS

Socio-demographic and clinical characteristics of participants

A total of 197 children were diagnosed with spastic cerebral palsy at the Paediatric Neurology Clinic of UDUTH, Sokoto, Nigeria over a period of 6 months. Of these 170 children that satisfied the inclusion criteria and fully complied with the schedules of physiotherapy in the 2 treatment groups (i.e., 85 participants per group) were included in the analysis. The mean age of the participants in the continuous group was 66.45 ± 47.7 months, while that of the intermittent group was 63.44 ± 44.29 months. There was no significant difference ($p > 0.05$) in the mean ages of the participants in both groups. Majority of the participants in both groups were aged 2-5 years, and there was no significant difference ($p > 0.05$) in the age distribution of both groups.

Majority of the participants in both groups were males (continuous group = 57.6%, Intermittent group = 60.0%) with an M:F ratio of 1.4:1; and there was no significant difference in the sex distribution of both groups. The quadriplegic type of CP predominated in both the continuous group (48.2%) and in the intermittent group (40%), and there was no significant difference ($p > 0.05$) in the distribution of type of CP in both groups. Close to half of the participants in both groups (47.1% in each group) had severe form of CP, and majority of the participants in both groups had moderate to severe spasticity. There was no significant difference in the severity of CP and spasticity in both groups. Likewise, there was no significant difference ($p > 0.05$) in the mean spasticity scores in the respective limbs in both groups, and in the overall mean GMFM-88 scores in both groups (Table 1).

Participants' spasticity and gross motor function status at baseline

The quadriplegic type of spastic CP showed more spasticity at baseline compared to the other types 3.39 ± 0.79 in the continuous group whereas the monoplegic type of spastic CP showed more spasticity in the intermittent group 3.67 ± 0.58 . However, there was no significant difference in the spasticity scores of the various types of CP in both groups, except for the Lt hemiplegic type which had a significantly higher score ($p < 0.05$) in the intermittent group (2.75 ± 0.96) as compared to the continuous group (2.28 ± 0.71) [Table 2]. The monoplegic type had the highest gross motor function scores compared to the other types in both groups, while the quadriplegic type had the lowest gross

motor function scores; but there was no significant difference ($p > 0.05$) in the gross motor scores of the various types of CP in both groups (Table 3).

Effect of treatment on spasticity among participants

There was a steady reduction in the mean spasticity scores in all the children following physiotherapy in both the continuous and the intermittent groups after 3 months, but the reduction was statistically significant in only the quadriplegic type in both treatment groups. After 6 months of therapy, marked and statistically significant reductions were observed in the spasticity scores in the various spastic CP types in both groups (Table 4). The proportion of participants with severe spasticity reduced substantially after 3 months treatment in both groups from 36.5% at baseline to 18.8% after 3 months in the continuous group, and from 40.0% at baseline to 22.4% after 3 months in the intermittent group, but there was no significant difference in the reductions in the two treatment groups. After 6 months treatment, the proportion of participants with severe spasticity reduced drastically to 5.9% in both groups (Table 5).

Effect of treatment on gross motor function among participants

Most of the participants showed an increase in their motor function steadily at 3 months and 6 months, but the improvement observed was more remarkable at 6 months as compared to 3 months in both the continuous and intermittent treatment groups (Table 6). Whereas, significant differences in improvement in gross motor function were observed in the respective spastic CP types in the two treatment groups (Table 6), overall, there was no significant difference in improvement in gross motor function at 3 and 6 months in the two treatment groups (Table 7).

DISCUSSION

This study assessed motor function in children with spastic cerebral palsy subjected to two modalities of physiotherapy. Under-fives constituted a larger proportion of the children while 11-15years was the lowest. This may be due to the fact that mortality is high amongst CP patients and the older ones tend to die from associated complications of CP. Majority of the children belong to the 2-5 years age group, this is similar to what was reported in studies done amongst CP children in Nigeria.^{1,3,4,27,28} Males predominated in this study 100 (58.8%) which is similar to the other studies conducted in Nigeria^{1,3,4,29,30} and other parts of the world.^{15,20}

Table 1: Socio-demographic and clinical characteristics of participants

Variables	Treatment group		Test of significance
	Continuous, n = 85 Frequency (%)	Intermittent, n = 85 Frequency (%)	
Age (months)			
Mean	66.45 ± 47.78	63.44 ± 44.29	t = 0.426
Range	24-180	24-180	p = 0.671
Age group (years)			
2 - <6	53 (62.4)	53 (62.4)	$\chi^2 = 0.000,$ p = 1.000
6 - <11	22 (25.9)	22 (25.9)	
11 - <15	10 (11.8)	10 (11.8)	
Sex			
Male	49 (57.6)	51 (60.0)	$\chi^2 = 0.970,$ p = 0.755
Female	36 (42.4)	34 (40.0)	
Type of spastic CP			
Monoplegia	6 (7.0)	3 (3.5)	$\chi^2 = 5.013,$ p = 0.286
Hemiplegia	19 (22.4)	18 (21.2)	
Diplegia	16 (18.8)	26 (30.6)	
Triplegia	0 (0)	1 (1.2)	
Quadriplegia	44 (51.8)	37 (43.5)	
GMFCS-ER			
Mild CP	30 (35.3)	28 (32.9)	$\chi^2 = 3.682,$ p = 0.451
Moderate CP	15 (17.6)	17 (20.0)	
Severe CP	40 (47.1)	40 (47.1)	
Spasticity			
Mild	13 (15.3)	10 (11.8)	$\chi^2 = 0.530,$ p = 0.767
Moderate	41 (48.2)	41 (48.2)	
Severe	31 (36.5)	34 (40)	
Mean spasticity score			
RUE MAS	3.41 ± 0.77	3.34 ± 0.71	t = 0.180, p = 0.857
LUE MAS	3.34 ± 0.71	3.38 ± 0.75	t = 0.854, p = 0.789
RLE MAS	3.41 ± 0.83	3.55 ± 0.67	t = 0.854, p = 0.395
LLE MAS	3.34 ± 0.76	3.48 ± 0.74	t = 1.026, p = 0.307
Mean GMFM-88 score	42.75 ± 32.71	37.47 ± 31.03	t = 0.963, p = 0.338

CP: Cerebral palsy; GMFCS-ER: Gross Motor Classification System-Expanded and Revised; MAS: Modified Ashworth Scale; RUE: Rt upper extremity; LUE: Lt upper extremity; RLE: Right lower extremity; LLE: Left lower extremity

Table 2: Participants' spasticity scores in different types of spastic cerebral palsy at baseline

Type of spastic cerebral palsy	Treatment group		Test of significance
	Continuous Mean ± SD	Intermittent Mean ± SD	
Monoplegia	3.17 ± 0.98	3.67 ± 0.58	t = 0.798, p = 0.451
Diplegia	3.36 ± 0.50	3.20 ± 0.76	t = 0.690, p = 0.494
Lt Hemiplegia	2.28 ± 0.71	2.75 ± 0.96	t = 0.000, p < 0.001*
Rt hemiplegia	2.91 ± 0.70	3.07 ± 0.70	t = 0.562, p = 0.858
Quadriplegia	3.39 ± 0.79	3.50 ± 0.12	t = 0.555, p = 0.581

*Statistically significant (p < 0.05)

Table 3: Participants' gross motor function scores in different types of spastic cerebral palsy at baseline

Type of spastic cerebral palsy	Treatment group		Test of significance
	Continuous Mean ± SD	Intermittent Mean ± SD	
Monoplegia	78.52 ± 20.34	82.55 ± 16.53	t = 0.279, p = 0.791
Diplegia	41.82 ± 28.07	43.58 ± 25.03	t = 0.710, p = 0.944
Hemiplegia	69.10 ± 19.49	50.38 ± 31.98	t = 1.936, p = 0.630
Quadriplegia	28.53 ± 30.60	28.53 ± 0.60	t = 0.125, p = 0.901

Table 4: Comparative assessment of spasticity at baseline, 3 months and 6 months according to subtypes of spastic CP

Type of spastic CP	Continuous group, n = 85		Intermittent group, n = 85	
	MAS Score Mean ± SD	Test of significance	MAS Score Mean ± SD	Test of significance
Monoplegia				
Baseline	3.170 ± 0.983		3.667 ± 0.577	
At 3 months	2.830 ± 0.752	t = 1.581, p = 0.175	3.000 ± 0.001	t = 2.000, p = 0.184
At 6 months	1.830 ± 0.983	t = 2.739, p = 0.041*	2.333 ± 1.154	t = 1.000, p = 0.423
Diplegia				
Baseline	3.360 ± 0.497		3.200 ± 0.764	
At 3 months	3.070 ± 0.616	t = 2.280, p = 0.400	2.760 ± 0.926	t = 4.342, p < 0.001*
At 6 months	2.360 ± 0.497	t = 5.701, p < 0.001*	2.160 ± 1.028	t = 6.000, p < 0.001*
Rt Hemiplegia				
Baseline	2.909 ± 0.701		3.071 ± 0.730	
At 3 months	2.636 ± 0.674	t = 1.936, p = 0.820	2.929 ± 0.616	t = 1.472, p = 0.165
At 6 months	1.727 ± 0.647	t = 5.590, p < 0.001*	2.142 ± 0.663	t = 6.904, p < 0.001*
Lt Hemiplegia				
Baseline	2.750 ± 0.707		2.750 ± 0.957	
At 3 months	2.125 ± 0.835	t = 3.416, p = 0.110	2.750 ± 0.957	t = 1.500, p = 0.165
At 6 months	1.727 ± 0.647	t = 2.646, p = 0.330	2.143 ± 0.663	t = 6.000, p < 0.001*
Quadriplegia				
Baseline	3.361 ± 0.761		3.432 ± 0.590	
At 3 months	3.138 ± 0.866	t = 2.935, p < 0.001*	3.189 ± 0.761	t = 2.145, p < 0.001*
At 6 months	2.583 ± 1.052	t = 5.488, p < 0.001*	2.513 ± 0.750	t = 6.191, p < 0.001*

*Statistically significant (p < 0.05)

Table 5: Comparison of grading of severity of spasticity at baseline, 3 months and 6 months

Phase of treatment	Severity of spasticity	Continuous group, n = 85 Frequency (%)	Intermittent group, n = 85 Frequency (%)	Test of significance
Baseline	Minimal – moderate	54 (63.5)	51 (60.0)	$\chi^2 = 0.224$; p = 0.636
	Severe	31 (36.5)	34 (40.0)	
3 months	Minimal – moderate	69 (81.2)	66 (77.6)	$\chi^2 = 0.324$; p = 0.569
	Severe	16 (18.8)	19 (22.4)	
6 months	Minimal – moderate	80 (94.1)	80 (94.1)	$\chi^2 < 0.001$; p = 1.000
	Severe	5 (5.9)	5 (5.9)	

Table 6: Comparative assessment of gross motor function at baseline, 3 months and 6 months according to subtypes of spastic CP

Variables	Continuous group Mean ± SD	Intermittent group Mean ± SD	Mean difference	Test of significance
Monoplegia				
Baseline	78.52 ± 20.34	82.55 ± 16.53	-4.03	
At 3 months	82.55 ± 17.60	84.54 ± 15.14	-3.38	t = 0.120, p = 0.034*
At 6 months	86.27 ± 11.60	86.27 ± 14.67	-2.16	
Diplegia				
Baseline	44.28 ± 27.82	43.58 ± 25.04	0.70	
At 3 months	48.09 ± 27.48	48.65 ± 25.20	-0.56	t = 0.038, p < 0.001*
At 6 months	51.03 ± 21.96	51.04 ± 21.96	-0.13	
Hemiplegia				
Baseline	69.10 ± 19.50	50.38 ± 31.99	1.94	
At 3 months	73.52 ± 19.19	56.89 ± 29.94	1.81	t = 0.044, p < 0.001*
At 6 months	75.03 ± 17.80	61.47 ± 28.54	1.56	
Quadriplegia				
Baseline	23.39 ± 27.59	24.46 ± 29.33	-0.13	
At 3 months	28.04 ± 28.20	28.51 ± 29.49	-0.05	t = 0.011, p < 0.001*
At 6 months	31.19 ± 24.96	31.19 ± 24.96	-0.12	

*Statistically significant (p < 0.05)

Table 7: Comparison of scores of GMFM-88 at pre- and post-treatment

Phase of treatment	Continuous group, n = 85 MAS Score Mean ± SD	Intermittent group, n = 85 MAS Score Mean ± SD	Test of significance
Baseline	42.75 ± 32.71	37.47 ± 31.03	t = 0.963, p = 0.338
3 months	47.17 ± 32.49	42.27 ± 31.01	t = 0.896, p = 0.372
6 months	49.75 ± 31.18	45.07 ± 28.82	t = 0.904, p = 0.368

The reasons why males tend to have more neurological problems remain uncertain, however, males differ in their response to brain injuries. They also tend to be at risk of more adverse perinatal events, and cultural values and practices in Africa tend to favor the male sex in terms of seeking for medical attention; and the fact that they are considered more valuable than the female children.^{31,32}

Spastic quadriplegia was the commonest type of CP in this study which was more associated with severe forms of CP; it remains so in most of the studies conducted in Africa and world-wide.^{1,3} Higher incidence of perinatal asphyxia and Central Nervous System infections are noted in Africa which may be responsible for the quadriplegic type.^{3,4,28,29} GMFCS-ER assessment in this study revealed more severe form of CP which was also observed in similar studies conducted in Nigeria and other parts of the world.^{8,33,34} There is still paucity of data concerning the functional classification of CP since

only few hospital workers are aware of this simple tool and the fact that most of the studies done were hospital based.³⁵ However, this could be due to the fact that more severe forms present to the hospitals in Nigeria.⁸ Higher levels of function were observed in other parts of the world in population based studies.^{35,36,37}

Spasticity in the upper limbs was higher in this study at baseline than in the lower extremities. This is contrary to what was observed in a study conducted by Gigante et al.³⁵ who observed more spasticity in the lower limbs. This may be due to a more homogeneous group of children with spastic diplegia and quadriplegia that were included in that study.³⁵ Overall, in the present study, there was no significant difference in mean spasticity between the two physiotherapy groups. This observation is similar to that obtained by Owuoye et al.²⁹ at LUTH, Nigeria. Furthermore, in the present study, continuous

physiotherapy was not superior to intermittent physiotherapy in terms of reduction of spasticity. Few studies have been conducted in children in Nigeria using MAS as an outcome measure³⁸ and those that used it had interventional studies using other modalities of treatment other than physical therapy (neuromuscular electric stimulation, cryotherapy, dorsal rhizotomy, multiple Ayurveda treatment and intra-thecal baclofen).^{35,39}

In this study continuous and intermittent physiotherapy were found to be equally effective. Both groups had statistically significant improvement in gross motor scores at 3 and 6 months which was similar to what was obtained by Christiansen et al.²³ who used a similar schedule for continuous and intermittent physiotherapy but for 30 weeks duration instead of the 24 weeks used in this study. However, Christiansen et al.¹⁵ studied a smaller number of homogeneous group of children. None of the groups of physiotherapy in their study resulted in a different GMFM-88 outcome measure.^{15,19} Contrary to this, other researchers observed that intermittent physiotherapy was better at improving gross motor function than continuous physiotherapy. Some of these studies were pilot studies^{20,40} with the resting period extending for 8 weeks compared to 6 weeks in this study. Furthermore, these authors^{20,40} used smaller sample size and more homogeneous group of children. In a meta-analysis which constituted randomized control trials addressing the controversy between the effectiveness of continuous and intermittent physiotherapy, Arpino et al.¹⁶ observed that more intensive therapy may improve outcome measure better.

CONCLUSION

In conclusion, this study shows that there is no difference between continuous and intermittent physiotherapy in terms of reduction in spasticity and improvement in motor function. Children improved steadily at 3 months with more marked improvement at 6 months following both types of physiotherapy. This gives Paediatric Neurologists and Paediatric Physiotherapists the option of tailoring the choice of therapy to what is more convenient for the patients and their caregivers. Also, considering the child's clinical presentation, needs and motivation, the choice of physiotherapy should be individualized.

Acknowledgments

The authors appreciate all the patients that participated in the study.

Source of support

Nil.

Conflict of interest

None declared.

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How to cite this article: Legbo JF, Ahmed H, Ahmad MM, Awosan KJ, Ango JT. Comparative assessment of motor function in children with spastic cerebral palsy subjected to two modalities of physiotherapy. *Int Arch Med Health Res* 2021; 2(2): 1-9.

Knowledge and practice of basic obstetric and newborn care among health workers in primary health facilities in Sokoto State, Nigeria

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ABSTRACT

Background: The World Health Organization states that about 15% of anticipated births worldwide will result in life-threatening complications during pregnancy, delivery, or postpartum. Because of the erratic nature of childbirth, emergency obstetric care has been called the bedrock in the arch of safe motherhood. Health workers are expected to possess good knowledge and appropriate practices to offer the signal functions that are the interventions for treating major causes of maternal complications and resuscitation of the newborn after delivery. **Aim:** This study aimed to determine the knowledge and practice of basic emergency obstetric and newborn care (BEmONC) among health workers in primary health facilities in Sokoto State, Nigeria. **Methods:** A cross-sectional study was conducted among 216 randomly selected health workers in the primary health facilities in Sokoto State, Nigeria. A structured self-administered questionnaire was used to collect data on the research variables. Data were analyzed using the IBM SPSS version 25 statistical computer software package. **Results:** Less than half of respondents had good knowledge (46.3%) and adequate practice (49.3%) of BEmONC with cadre being the sole predictor. Unskilled health workers were 99.2% less likely to have good knowledge of EmONC (aOR: 0.008; 95% CI: 0.002 – 0.027; $p < 0.001$) and 78.0% less likely to have adequate practice of EmONC (aOR: 0.022; 95% CI: 0.008 – 0.057; $p < 0.001$) as compared to the skilled health workers. **Conclusion:** This study showed that less than half of the respondents had good knowledge and adequate practice of basic EmONC with cadre being the sole predictor. The Sokoto State Primary Health Care Development Agency in conjunction with the Sokoto State Ministry of Health should provide a sufficient number of skilled health workers for the primary health facilities in the state in addition to organizing periodic on-the-job training for them.

Keywords: Knowledge, practice, basic EmONC, health workers, primary health facilities

INTRODUCTION

Mothers give and protect lives; they encourage the growth or development of potentials and render support to their communities in various ways based on their capabilities. However, for many women worldwide, bringing children into the world can be at the detriment of their lives because of the uncertainty of the birth outcome.¹ The high number of maternal and neonatal deaths in some areas of the world is evidence of inequities in access to health services and highlights the wide gap between the rich and poor.¹ About 2.7 million newborn babies die every year; in addition to this, another 2.6 million are stillborn, most of which die at home due to lack of skilled care that could greatly increase the possibility of them staying alive.² Most of these newborns die in rural areas of underdeveloped

countries from highly preventable causes.³ It is because of the erratic nature of childbirth that emergency obstetric and newborn care (EmONC) has been called the bedrock in the arch of safe motherhood.⁴

The EmONC care package addresses the main causes of maternal and early neonatal deaths.⁵ The World Health Organization (WHO) estimates that at least 88–98% of maternal and neonatal deaths can be averted with timely access to existing EmONC interventions.⁶ The quality of care in EmONC involves institutional and staff preparedness in the provision of appropriate emergency services while responding to the needs and rights of the clients. These include having skilled staff, functional equipment and supplies, and adequate infrastructure.⁷ Health workers' preparedness to provide

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Received: 19-09-2021

Revised: 05-11-2021

Accepted: 16-11-2021

Published: 30-12-2021

EmONC is the most critical element in the provision of quality care, in that they must have the knowledge and adequate skills to recognize an obstetric emergency and then respond appropriately.⁷ Health workers' knowledge and practice in EmONC services are important, especially in primary health facilities in countries with a high burden of maternal and neonatal mortality, because for most people, the primary healthcare centres (PHCs) are the only health facilities they can access.⁷

There are pieces of evidence from studies that in developing countries at least 15% of all pregnancies are expected to require emergency intervention, and the outcome of the majority of the attendant complications are unpredictable.^{8,9} Hence, deliveries should occur in facilities where health workers can provide appropriate management for complications during delivery.¹⁰ Almost 100% of births in developed countries occur with skilled birth attendants (SBAs), but more than half of births in sub-Saharan Africa still take place without the aid of SBAs.^{11,12} According to NDHS 2018, only 39% of births in Nigeria and 7.8% of deliveries in Sokoto State, Nigeria take place in health facilities. Only 43% of births in Nigeria and 9.2% of deliveries in Sokoto State, Nigeria are assisted by an SBA.¹⁰ There are more SBAs in secondary and tertiary healthcare facilities than primary healthcare facilities.¹⁰ The majority of health workers in PHC facilities across all states in Nigeria are Community Health Extension Workers (CHEWs).^{13,14} When complications occur, a timely diagnosis and appropriate intervention, both of which require good knowledge, practice and skills can prevent death, morbidity, and severe disability.^{15,16} Many of the health workers in the primary health facilities lack the knowledge and skills that are necessary to prevent, recognize and manage the major causes of maternal and newborn deaths.^{17,18}

A cross-sectional study in Banke, Nepal, found that the majority (89%) of auxiliary nurse midwives had good knowledge of maternal and newborn care.¹⁹ A study in Ethiopia showed that 88% had poor knowledge of danger signs and complications in pregnancy.²⁰ A study in southwest Nigeria showed that 91% of health workers had poor knowledge of EmOC.²¹ Another study in Rivers State, Nigeria showed that 28.9% urban and 16.4% rural health workers had good knowledge of EmONC.²² A study in Nigeria showed the most common signal function performed in the primary health care centers was manual removal of placenta (66.7%), followed by administration of parenteral oxytocics (65.0%) and antibiotics (63.3%).²³

Due to the shortage of skilled manpower in Sokoto State, Community Health Extension Workers (CHEWs) are trained alongside Community Health Officers (CHOs), nurses, and midwives through the modified life-saving skills to conduct deliveries and perform the basic EmONC signal functions.^{24,25} Despite the need to proffer solutions to the health workforce shortage, it is important to have providers with good knowledge and adequate practice providing basic EmONC services, particularly in places with a high burden of maternal and newborn mortality like Sokoto State. This study will provide data on the level of knowledge and practices of health workers in offering EmONC services, especially as the majority of the health workers in the primary health facilities in the state are not statutorily expected to take deliveries but are now part of the workforce in the maternity units of these facilities. This study was conducted to determine the knowledge and practice of basic emergency obstetric and newborn care among health workers in primary health facilities in Sokoto State, Nigeria.

MATERIALS AND METHODS

Study Design and Population

This cross-sectional study was carried out in Sokoto State, Nigeria from April to June 2019. The state is made up of twenty-three Local Government Areas (LGAs) of which four are metropolitan.²⁶ The study population comprised midwives, nurses, CHOs, SCHEWs and JCHEWs offering maternity services in the primary healthcare facilities in the state. All those who have been in the maternity unit of the respective facilities for at least 6 months before the commencement of the study were considered eligible and enrolled into the study, while those who were on leave at the commencement of the study were excluded.

Sample Size Estimation and Sampling Technique

Two hundred and sixteen eligible participants were selected by a two-stage sampling technique and enrolled into the study following sample size estimation. In stage 1, two of the three senatorial zones in the state were selected by simple random sampling using the balloting option. In stage 2, four of the eight LGAs in each of the selected senatorial zones were selected by simple random sampling using the balloting option. All the 10 primary health facilities in each of the selected LGAs (making a total of 80) were used as study centers. Also, all the eligible health workers in the maternity unit of the selected primary health facilities were enrolled into the study.

Data Collection and Analysis

A structured interviewer-administered questionnaire was adapted from the instrument used in previous studies^{15,19,27-31} and used to obtain information on the respondents' socio-demographic characteristics, and their knowledge and practices regarding EmONC. The questionnaire was reviewed by senior researchers in the Department of Community Health, Usmanu Danfodiyo University Sokoto, Nigeria to ascertain content validity. Ten Community Health Officers (CHOs) 2nd year students were recruited as research assistants and trained on the objectives of the study, selection of study subjects, field activities and questionnaire administration. The questionnaire was pretested on 12 health workers in Wurno LGA (being one of the LGAs that were not selected for the study) by the principal researcher and the research assistants (after their training).

Knowledge of EmONC was assessed on a 69-item scale, one point was awarded for a correct response, while a wrong response or none response received no point; this gives a minimum of 0 and a maximum of 69 points. Those who scored ≥ 35 points were graded as having good knowledge, while those who scores < 35 points were graded as having poor knowledge. Practice of EmONC was assessed on a 30-item scale, one point was awarded for observing a practice, while zero was awarded for not observing it; this gives a minimum of 0 and a maximum of 30 points. Those who scored ≥ 15 points were graded as having adequate practice, while those who scores < 15 points were graded as having inadequate practice. Data were analyzed using the IBM SPSS version 25.0 statistical software package. Quantitative variables were summarized using mean and standard deviations, while qualitative variables were summarized using frequencies and percentages. Binary logistic regression analysis was used to determine the predictor of good knowledge and adequate practice of EmONC. All levels of statistical significance were set at $p < 0.05$.

Ethical Consideration

Ethical approval for the study was obtained from the Research and Ethics Committee of Sokoto State Ministry of Health, Sokoto, Nigeria. Permission was obtained from the State Primary Health Care Development Agency before proceeding with the study, while informed consent was obtained from the participants.

RESULTS

Socio-demographic characteristics of respondents

The ages of the respondents ranged from 20-62 years with a mean age of 34.6 ± 8.9 years and majority of them 133 (61.6%) were aged 30-49 years. Majority of the 216 respondents were females 179 (82.5%) and married 176 (81.4%). Most of the respondents 200 (92.6%) were Moslems, and the majority of them were Community Health Extension Workers 135 (62.5%) and have being in practice for less than 10 years 128 (59.3%). Less than a half of respondents 95 (44.0%) attended a training program on EmONC in the past one year [Table 1].

Table 1: Socio-demographic characteristics of respondents

Variables	Frequency (%) n = 216
Age group (years)	
20-29	67 (31.0)
30-39	85 (39.4)
40-49	48 (22.2)
50-59	13 (6.0)
≥ 60	3 (1.4)
Sex	
Male	37 (17.1)
Female	179 (82.9)
Religion	
Islam	200 (92.6)
Christianity	16 (7.4)
Marital status	
Single	34 (15.7)
Married	176 (81.4)
Separated	1 (0.5)
Divorced	4 (1.9)
Widowed	1 (0.5)
Cadre	
Midwife	19 (8.8)
Nurse	15 (6.9)
CHO	47 (21.8)
SCHEW	64 (29.6)
JCHEW	71 (32.9)
Years of practice	
< 10	128 (59.3)
≥ 10	88 (40.7)
Attended training on EmONC in the past one year	95 (44.0)

Respondents' knowledge of types and components of EmONC

None of the respondents knew the types of EmONC. Although, the majority of the 216 respondents knew parenteral oxytocin 138 (63.9%), assisted vaginal delivery 134 (62.0%) and manual removal of placenta 128 (59.3%) as a component of EmONC, only about a third of them knew neonatal resuscitation 65 (30.1%), blood transfusion 85 (39.4%), and caesarean section 69 (31.9%) as components of EmONC (Table 2).

Table 2: Respondents' knowledge of components of emergency obstetric and newborn care

Variables	Correct responses Frequency (%) n = 216
Types of EmONC	0 (0)
Components of EmONC	
IV antibiotics	109 (50.5)
IV anticonvulsants	121 (56.0)
IV oxytocin	138 (63.9)
Assisted vaginal delivery	134 (62.0)
Manual removal of placenta	128 (59.3)
Removal of retained product	53 (24.5)
Neonatal resuscitation	65 (30.1)
Blood transfusion	85 (39.4)
Caesarean section	69 (31.9)

Respondents' knowledge of causes of maternal mortality and complications averted by EmONC

Whereas, the majority of the 216 respondents knew postpartum haemorrhage 138 (63.9%), eclampsia 147 (68.1%) and obstructed labour 131 (60.6%) as direct causes of maternal mortality, only 51 (23.6%) knew that malaria is not a direct cause of maternal mortality, and the most commonly identified complications that can be averted by EmONC were haemorrhage 136 (63.0%) and pre-eclampsia/eclampsia 134 (62.0%) [Table 3].

Table 3: Respondents' knowledge of causes of maternal mortality and complications averted by EmONC

Variables	Frequency (%) n = 216
Causes of maternal mortality	
Postpartum haemorrhage	138 (63.9)
Postpartum psychosis	50 (23.1)
Eclampsia	147 (68.1)
Prepartum migraine	36 (16.7)
Sepsis	116 (53.7)
Obstructed labour	131 (60.6)
Septic abortion	100 (46.3)
Malaria	51 (23.6)
Anaemia	90 (41.7)
Multiple gestation	115 (53.2)
Seizures	67 (31.0)
Complications averted by EmONC	
Haemorrhage	136 (63.0)
Pre-eclampsia/Eclampsia	134 (62.0)
Malaria in pregnancy	81 (37.5)
Prolonged obstructed labour	113 (52.3)
Sepsis	100 (46.3)
Foetal distress	103 (47.7)

Respondents' knowledge of management of the commonest causes of maternal and neonatal mortality

The majority of the 216 respondents knew that oxytocin is used in the management of post-partum haemorrhage

142 (65.7%). Depressed breathing was the most commonly known sign of birth asphyxia 171 (79.2%), while weakness was the least known sign of birth asphyxia 107 (49.5%). Less than a half 100 (46.3%) of them had good knowledge of the management of the commonest causes of maternal and neonatal mortality (Table 4).

Table 4: Respondents' knowledge of management of commonest causes of maternal and newborn mortality

Variables	Frequency (%)	n
		= 216
Eclampsia		
IV fluids	134 (62.0)	
IM MgSO ₄ (5g on each buttock)	134 (62.0)	
IV MgSO ₄ (5g)	39 (18.1)	
IM MgSO ₄ (5g on alternate buttock)	54 (25.0)	
Postpartum haemorrhage		
IV fluids	98 (45.4)	
Oxytocin	142 (65.7)	
Antibiotics	98 (45.4)	
Refer	106 (49.1)	
Obstructed labour		
IV fluids	131 (60.6)	
IM MgSO ₄ (5g on each buttock)	67 (31.0)	
Oxytocin	125 (57.1)	
Antibiotics	151 (69.9)	
Caesarean section	116 (53.7)	
Refer	161 (74.5)	
Birth asphyxia signs and management		
Depressed breathing	171 (79.2)	
Weakness	107 (49.5)	
Increased heart rate	154 (71.3)	
Cyanosis	142 (65.7)	
IV fluids	101 (46.8)	
Suctioning	166 (76.9)	
Use of face mask/ambu bag	174 (80.6)	
Refer	165 (76.4)	
Overall knowledge grade		
Good knowledge	100 (46.3)	
Poor knowledge	116 (53.7)	

Respondents' practice of basic EmONC signal functions and routine observation and practices during labour

Only 79 (36.6%) of the 216 respondents often looked out for convulsion in pregnant women. About half of the respondents 115 (53.2%) often looked out for high blood pressure in pregnant women. Also, half of the respondents 109 (50.5%) often looked for oedema in pregnant women (Table 5).

Sixty-eight (31.5%) of the respondents routinely use partograph to monitor the progress of labour. The most commonly performed signal function was parenteral oxytocin 153 (70.5%), less than half 91 (42.1%) had

performed manual removal of placenta in the past 3 months, and less than half, 106 (49.1%) of the 216 respondents had adequate practice of basic EmONC signal functions (Table 6).

Table 5: Respondents' routine observation for danger signs in pregnant women

Danger signs	Frequency (%) n = 216
Vaginal bleeding	109 (50.5)
Prolonged labour	104 (48.1)
Convulsion	79 (36.6)
Oedema	109 (50.5)
Anaemia	111 (51.4)
High blood pressure	115 (53.2)
Fetal heart rate	89 (39.4)
Malpresentation	76 (35.2)
Severe headache	91 (42.1)
Severe vomiting	91 (42.1)
Offensive vaginal discharge	101 (46.8)
High fever	111 (51.4)
Low blood pressure	91 (42.1)
Blurred vision	79 (36.6)
Abdominal pain with fainting attack	77 (35.6)
Burning epigastric pain	74 (34.3)
Premature rupture of membrane	82 (38.0)
High pulse rate	85 (39.4)

Predictor of knowledge and practice of EmONC among respondents

The only predictor of good knowledge and adequate practice of basic EmONC among the respondents was their cadre. Unskilled health workers (i.e., SCHEWs and JCHEWs, as they were not statutorily trained to perform EmONC functions) were 99.2% less likely to have good knowledge of EmONC (aOR: 0.008; 95% CI: 0.002 – 0.027; $p < 0.001$) and 78.0% less likely to have adequate practice of EmONC (aOR: 0.022; 95% CI: 0.008 – 0.057; $p < 0.001$) as compared to the skilled health workers [Table 7].

DISCUSSION

This study assessed the knowledge and practice of basic emergency obstetric and newborn care among primary healthcare workers in Sokoto State, Nigeria. Majority of the health workers in this study were CHEWs, and this is similar to finding in a study conducted in the southwestern part of Nigeria,²¹ but differs from the finding in a study conducted in Rivers State²² where most of the respondents were midwives/nurses.

Table 6: Respondents' practice of basic emergency obstetric and newborn care signal functions and routine observation and practices during labour

Danger signs	Frequency (%) n = 216
Used partograph routinely	68 (31.5)
Parenteral antibiotics	145 (67.1)
Parenteral oxytocics	153 (70.8)
Manual removal of placenta	91 (42.1)
Removal of retained products	122 (56.5)
Newborn resuscitation	99 (45.8)
Inadequate dilatation of the cervix	158 (73.1)
Irregular uterine contraction	164 (75.9)
Discharge of bloody mucus	154 (71.3)
Breaking of water/rupture of membrane	150 (69.4)
Immediate oxytocin	202 (93.5)
Controlled cord traction	212 (98.1)
Overall practice grade	
Adequate practice	106 (49.1)
Inadequate practice	110 (50.9)

The preponderance of CHEWs in this study and among the health personnel of the state may be because their emolument is less than those of nurses/midwives, making it economically expedient for government to employ more CHEWs as compared to the other health workers in the state's health workforce.

Within the past one year, less than half of the respondents in this study had received training on EmONC, implying that their exposure to in-service training on EmONC was inadequate. It is therefore not surprising that none of them could mention the types of EmONC, and most of them did not know the components of basic EmONC. This contrasts with the findings from a study in Rivers State, Nigeria where most of the respondents could mention the types and identify the components of EmONC.²² The dissimilarity may be attributed to the frequency of training, and the cadre of respondents. Not knowing the types and components of EmONC means they would not also know what complications they are expected to manage and the ones to refer to the next level of care. This is dangerous because a woman who needs to be referred may be retained at the PHC level where they lack the facilities and skills to manage her condition which could result to death, thereby increasing maternal and neonatal deaths. These findings underscore the need for the State Primary Healthcare Development Agency to organize periodic on-the-job training particularly on EmONC for the primary healthcare workers in the state in

Table 7: Predictor of knowledge and practice of EmONC among respondents

Variables	Knowledge				Practice			
	aOR	95% CI		p-value	aOR	95% CI		p-value
		Lower	upper			lower	upper	
Age (<40 vs > 40*)	0.700	0.235	2.080	0.520	1.417	0.516	3.896	0.499
Sex (Female vs Male*)	0.633	0.229	1.750	0.378	0.965	0.364	2.557	0.943
Marital Status (Unmarried vs Married*)	0.730	0.256	2.086	0.557	0.991	0.367	2.677	0.985
Religion (Islam vs Christianity*)	0.573	0.097	3.391	0.540	1.655	0.442	6.203	0.455
Cadre (Skilled vs Unskilled*)	0.008	0.002	0.027	<0.001**	0.022	0.008	0.057	<0.001**
Years of practice (<10yrs vs ≥10yrs*)	0.958	0.556	1.650	0.878	0.958	0.556	1.650	0.878

aOR = adjusted Odds Ratio; CI = Confidence Interval; * Reference group; **Significant (p < 0.05)

conjunction with the State Ministry of Health, Non Governmental Organizations, and other stakeholders who are involved in promoting maternal and child health.

The most identified major cause of mortality by the respondents in this study was eclampsia followed by postpartum haemorrhage; this is similar to the finding in a study in south-south Nigeria which reported haemorrhage topping the list followed by pregnancy-induced hypertension.²² The risk factors for haemorrhage are common in the study area; hence the health workers are faced with many cases of haemorrhage. Majority of the respondents did not know that malaria is an indirect cause of maternal mortality. This is a direct contrast from the finding in a similar study in southern Nigeria, where 69.9% of respondents could identify malaria as an indirect cause of maternal mortality.²² Since malaria is endemic in Nigeria, it's a common presentation of pregnant women at various health facilities, it is erroneously assumed by many to be a major direct cause of maternal mortality. The majority of the respondents knew that haemorrhage and eclampsia could be averted by BEmONC. This may not be surprising as they knew that haemorrhage and eclampsia were major causes of maternal mortality. Their knowledge of this may improve their response when they encounter patients with these conditions, which may help in reducing deaths as a result of haemorrhage and eclampsia.

The least reported assessment from a partograph by the respondents in this study was dehydration in mother, this is also similar to the finding of the study conducted in Ethiopia.³² The majority of the respondents did not know the correct dosage of intravenous MgSO₄ for the management of eclampsia. The dosage was changed to 5g and the majority of the respondents still considered it to be correct. An overdose of drugs could result to other complications which may affect the newborn's health, hence, prolonging their hospital stay. Only a quarter knew that the drug should be given on alternate buttocks. This may be because they only administer a loading dose of MgSO₄ and refer. This increases the workload for health workers at the next level of care. It is imperative for midwives and nurses to acquire the basic knowledge and skills that are required to manage eclampsia. To achieve this, training institutions should pay sufficient attention to it in their training curriculum, while heads of institution and policymakers should facilitate periodic on-the-job training on how to carry out this function effectively when the need arises.

More than half of them thought antibiotics should be given as part of the management for postpartum haemorrhage and obstructed labour. The severity of an illness is perceived to be higher when a patient receives intravenous fluids and antibiotics. Many health workers often consider a management regimen incomplete when antibiotics are not administered. Studies have shown there is an over-prescription of antibiotics by health workers, and overuse by the public.^{33,34}

This has contributed to the abuse of antibiotics in Nigeria; it is also a contributing factor to antibiotic resistance which could also increase the duration of hospital stay, increase medical cost, and result to more deaths.³⁴ About half of them did not know that the caesarean section is a part of the management for obstructed labour. This is similar to the finding in a study in Malawi where only (56.0%) of the respondents could identify the right management for pre-eclampsia and eclampsia.³⁵ Not knowing the right management for certain conditions is endangering the lives of pregnant women and their newborns; especially when the wrong management is given, resulting in very devastating consequences.

Regarding the practice of EmONC, most of the respondents in this study do not routinely monitor labour with a partograph. This is less than the finding in Ethiopia where 57.3% of respondents routinely use a partograph to monitor a woman in labour.²⁷ For a woman with prolonged or obstructed labour a timely decision could save her and her baby with the use of a partograph. A woman with obstructed labour may die within 72 hours in the absence of timely intervention.³⁶ The most performed signal function by the respondents in this study was the administration of parenteral oxytocin, probably because it requires little skill. This is similar to the finding in a study conducted in six countries including Nigeria but slightly different from the finding in a study conducted in Oyo State Nigeria where the most performed signal function was manual removal of placenta, followed by administration of parenteral oxytocin.^{23,37} Oxytocin has been identified as the best drug for the prevention of postpartum haemorrhage, WHO recommends it as the first-line drug for active management of the third stage of labour.³⁸ Life-threatening conditions may develop spontaneously, often in previously uncomplicated pregnancies.⁴ Hence, the need for SBAs to have the capacity to identify danger signs during pregnancy, labour and delivery; and provide timely interventions and referral when the need arises.³⁶

Just about half of the respondents check for bleeding in their patients. Bleeding remains the number one cause of death among pregnant women, and all SBAs should always lookout for it. Without prompt treatment, those with postpartum and antepartum haemorrhage may die within 2 and 12 hours respectively.³⁶ Only a third of the respondents often lookout for convulsion in pregnant women. Oedema, severe headache, epigastric pain, blurred vision, and high blood pressure are accompanying warning signs for pre-eclampsia and

eclampsia; therefore, they should not be overlooked. Women with eclampsia could die within 2 days if appropriate and timely intervention is not given.³⁶ There is a need for training and retraining of health workers; also, on the job supervision is necessary to help improve their practices.

Less than half of the respondents in this study often lookout for severe vomiting in pregnant women. Nausea and vomiting are usual signs in pregnancy, but when it is severe, it could lead to dehydration, and if it is not properly managed can result in shock and possibly death. Only half and less than half of the respondents were in check for high fever offensive and vaginal discharge respectively, these may be pointers to sepsis. Pregnant women with infection if not given appropriate medical intervention could die within 6 days.³⁶ All these deaths are preventable, but if the health workers cannot identify and manage them properly then women will keep dying because of sepsis.

Less than half and only a third of the respondents in this study assess their patients for low blood pressure and high pulse rate. These are indicators that the patient is in shock, but most of the respondents overlook these signs. A patient in shock may be missed because the signs were not observed and the consequences could be devastating. Most of the signs that were listed earlier (hemorrhage, severe vomiting, sepsis, anemia, prolonged labor, etc.) could lead to shock. A similar study in Nepal showed that the respondents had good knowledge of the danger signs, but only 26.0% of them check for and manage the danger signs seen in pregnancy appropriately.¹⁹

The labour practices of the respondents in this study were fair as most of them often lookout for inadequate dilatation of the cervix, irregular uterine contraction, discharge of blood and mucous, and rupture of membrane. The majority of the respondents gave oxytocin and performed controlled cord traction as part of active management of the third stage of labour (AMTSL), which is ideal. This is similar to the finding in a study in Rwanda where 80.0% of the respondents gave oxytocin to women in labour, but the proportion of respondents who performed controlled cord traction was low (40.2%).³⁹ A study in Nepal showed that check-up and management when danger signs were seen during delivery was 11.0%, and during the postnatal period, it was 15.0%.¹⁹ This is different from the findings in this study where labour practices were better than during pregnancy.

While the finding of cadre being the sole predictor of good knowledge and adequate practice of basic EmONC in this study with unskilled workers (i.e., JCHEWs and SCHEWs) being less likely to have good knowledge of EmONC and adequate practice of EmONC is not surprising as they were not statutorily trained to perform EmONC functions, it brings to the fore the need for the state government to ensure that the maternity units in the primary health facilities across the state are adequately staffed with skilled birth attendants in addition to organizing periodic on-the-job training on how to carry out EmONC functions for them.

CONCLUSION

This study showed that less than half of the respondents had good knowledge and adequate practice of basic EmONC with cadre being the sole predictor. The Sokoto State Primary Health Care Development Agency in conjunction with the Sokoto State Ministry of Health should provide a sufficient number of skilled health workers for the primary health facilities in the state in addition to organizing periodic on-the-job training for them.

Acknowledgments

The authors appreciate everyone who has contributed to the success of this work, especially the consultants and resident doctors in the Department of Community Medicine, Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria, and all the health workers that participated in the study.

Source of support

Nil.

Conflict of interest

None declared.

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How to cite this article: Inoh EE, Oche MO, Awosan KJ, Ezenwoko ZA, Attahiru A, Inoh MI. Knowledge and practice of basic obstetric and newborn care among health workers in primary health facilities in Sokoto State, Nigeria. *Int Arch Med Health Res* 2021; 2(2): 10-18.

Prevalence and predictors of overweight and obesity among adults in rural and urban communities of Sokoto State, Nigeria

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ABSTRACT

Background: Overweight and obesity have reached epidemic proportions in both the developed and developing countries of the world. **Aim:** This study aimed to determine the prevalence and predictors of overweight and obesity in urban and rural populations of Sokoto State, Nigeria. **Materials and Methods:** A comparative cross-sectional study was conducted among 430 adults selected by multi-stage sampling technique. Anthropometric assessment was in addition to questionnaire administration. Data were analyzed using IBM SPSS version 25 statistical computer software package. **Results:** The prevalence of overweight and obesity was high in both the urban and rural groups in this study, but it was significantly higher ($p < 0.05$) in the urban group (overweight = 22.3%, obesity = 24.3%) as compared to the rural group (overweight = 17.7%, obesity = 7.4%). The predictors of overweight / obesity in the rural group were being married, average monthly income $< \text{N}30,000:00$ and consumption of fatty foods; while the predictors of overweight / obesity in the urban group were not engaging in moderate intensity sport, fitness or recreational activities, and family history of overweight and obesity. **Conclusion:** This study showed high prevalence of overweight and obesity among adults in urban and rural communities of Sokoto State, Nigeria. These findings underscore the need for the Ministry of Health, Sokoto State, Nigeria to organize sensitization campaigns through the mass media to create awareness on the prevention and control of overweight and obesity among the residents in the state. In addition, the Sokoto State Government should make poverty alleviation and provision of sports and recreation facilities in workplaces top priorities.

Keywords: Overweight, obesity, prevalence, predictors, adults

INTRODUCTION

Overweight and obesity have reached epidemic proportions in both the developed and developing countries in the world with at least 1.70 billion people being affected and at least 300 million being obese.^{1,2} In a study on the prevalence of overweight and obesity in adults in twenty European countries in 2014, it was found that overweight and obesity accounted for 53.1% of the studied population.³ It was estimated that in 2010, England had 6.6 million obese men (which account for 33% of the population) and 5.9 million obese women (which account for 28% of the population) and it is estimated that with the current trend, by 2050, 60% of males and 50% of females in England will be obese.⁴ In Malaysia a study found that 51.2% of the respondents were overweight /obese.⁵

an alarming rate.⁶ A study by Munyogwa and Mtunwa⁷ in Tanzania reported an obesity prevalence of 28.8%, while in Ghana the national prevalence of overweight and obesity was estimated to be 25.4%.⁸ In addition, Banwat et al⁹, and other researchers¹⁰⁻¹⁵ have also documented the prevalence of obesity in Nigeria.

Similar to the situation across the African continent, the burden of overweight and obesity is high in Nigeria. Data from the World Health Organization (WHO) shows that the prevalence of overweight and obesity increased by 20% between 2002 and 2010 in Nigeria.¹⁰ According to the 2010 WHO survey data on Nigeria, the prevalence of overweight was 26% and 37% in men and women respectively.¹⁰ High overweight prevalence rates were principally reported in studies conducted across

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Nigeria including Ile-Ife (20.3%),¹¹ and Lagos (22.2%).¹² The prevalence of obesity is also high in Nigeria in concomitance with that of overweight. In 2020 about 12 million persons were estimated to be obese in Nigeria with a considerably higher prevalence among women.¹³ High obesity prevalence rates were reported in several studies conducted across Nigeria including Abuja (22.3%),¹ Southwestern Nigeria (20.8%),¹⁴ and Sokoto (15.2%).¹⁵

Overweight and obesity are associated with several diseases including cardiovascular disease, diabetes and several types of cancers,¹⁶ and they are the fifth leading risk for global deaths. At least 2.8 million adults die each year as a result of being overweight or obese. In addition, 44% of diabetes burden, 23% of ischemic heart disease burden and between 16% and 41% of certain cancer burden are attributed to overweight and obesity.^{17,18}

Obesity is linked with huge economic cost, with an estimated cost of 147 billion dollars in 2008 in the United States of America.¹⁹ Although, there are no documented estimates of the economic cost of obesity in Nigeria, it may run into several billions of Naira a year, and it is believed that the increasing prevalence of obesity in Nigeria will cause significant impact on the national health budget, in addition to other costs including work absenteeism, presenteeism, increased risk of occupational accidents and injuries, reduced productivity, emotional and psychological problems, low self-esteem, anxiety, depression and suicidal attempts in extreme cases.^{4,20,21}

The development of obesity has been attributed to the contribution of environmental and genetic factors.¹⁴ Increasing number of communities worldwide are becoming vulnerable to the development of obesity or overweight as a result of increased dietary intake. It is believed that the fundamental cause of overweight and obesity is the energy imbalance between calories consumed and calories expended. Globally, there has been increased intake of energy-dense foods that are high in fat, and increase in physical inactivity due to increasing sedentary nature of many forms such as spending much time on TV, changing modes of transportation, increasing urbanization and so on.^{17,18} In addition to unhealthy dietary intake and physical inactivity several factors including age, gender, marital and socioeconomic status, occupation, and place of residence (i.e., rural versus urban) have been found to be associated with overweight and obesity.²²

Whereas, some data exist on the prevalence of overweight and obesity among urban and semi urban Nigeria,²² there is limited information exists on the prevalence of the risk factors for overweight and obesity in adult Nigerian population especially in rural setting.¹⁴ Also, data on obesity have been commonly reported in the past among specific risk groups such as hypertensive and diabetic populations and many of them are hospital-based.²³

Whereas, variations in the prevalence of overweight and obesity in urban and rural populations have been documented in several studies, sufficient attention has not been paid to the variations in the factors that are associated with them, and specifically those that predict their occurrence in the urban and rural populations across Nigeria.^{14,22} Knowing the prevalence and predictors of overweight and obesity in the urban and rural populations in Sokoto State is crucial to designing appropriate strategies for their prevention and control across the state. This study was conducted to determine the prevalence and predictors of overweight and obesity in urban and rural populations of Sokoto State, Nigeria.

MATERIALS AND METHODS

Study Design, Population and Area

A comparative cross-sectional study was conducted among adults aged eighteen years and above in rural and urban areas of Sokoto State, Nigeria, in November and December 2020. Sokoto State is located in the North western part of Nigeria between longitudes 4°8'E and 6°54'E and latitudes 12°N and 13°58'N. It shares common borders with Niger Republic to the north, Kebbi State to the southwest and Zamfara State to the east. It has 23 Local Government Areas with a total land area of about 32,000 square Km, and an estimated population of 5,033,495 projected for 2016 based on the 2006 general census.²⁴ Household members aged ≥ 18 years who were present at the time of conduct of the study and gave their consent to participate were considered eligible and enrolled in the study. Pregnant women and those too ill or with debilitating disease conditions that made it difficult to take their anthropometry were excluded.

Sample Size Estimation and Sampling Technique

The sample size was estimated at 215 per group using the formula for calculating the sample size for proportion in comparison of two groups,²⁵ a 13.9% prevalence of obesity in an urban area from a previous study,²⁶ a 5.6% prevalence of obesity in a rural area from a previous study,²⁷ and an anticipated 90% response rate.

The eligible participants were selected by a multi-stage sampling technique. In stage 1, one urban LGA and one rural LGA were selected from the 5 urban and 18 rural LGAs in the state (as classified by the state), in stage 2, two wards were selected from the 11 wards in each of the selected LGA, and in stage 3, one settlement was selected from each of the 4 wards. All the selections from stages 1 to 3 were done through a simple random sampling technique by balloting. The population of the selected settlements was obtained and used to do proportionate allocation of the number of respondents to be enrolled in the respective settlements. In stage 4, systematic sampling technique was used to enroll households to obtain the study subjects after obtaining the sampling frame.

Data Collection

The methods of data collection comprised personal interview and physical assessment (i.e., anthropometry). A structured interviewer-administered questionnaire was used to obtain information on the socio-demographic characteristics of the study participants and behavioral measurements. The questions on behavioral measurements were adapted from the WHO STEPS Instrument for chronic diseases risk factors surveillance that was used for a national survey on health behavior monitor among Nigerian adult population.²⁸ Weight was measured with shoes off to the nearest 0.5kg using a Seca Optimal scale; it was validated with a standard weight and corrected for zero error, while height was measured without shoes to the nearest 0.5cm using a stadiometer. Eleven final year students of School of Health Information Management (SHIM), Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria and 3 students from the College of Health Technology, Gwadabawa, Nigeria were recruited as research assistants and trained on general principles of research, ethics of field work, the objectives of the study, selection of study subjects, field activities, interpersonal communication skills and use of survey instrument. The questionnaire was pretested on 29 adults in one of the LGAs that were not selected for the study; the necessary adjustment was effected based on the observations that were made during the pretesting.

Operational definition of terms

Body mass index (BMI) was calculated as weight (kg) divided by height² (m²) and used as marker for overweight and obesity.²⁹ Underweight was defined as BMI less than 18.5kg/m², normal weight was defined as BMI of 18.5 to 24.9kg/m², overweight was defined as BMI of 25.0 to 29.9kg/m², while obesity was defined as BMI of 30.0kg/m² and above.

Data Analysis

Data were analyzed using IBM SPSS version 25 computer statistical software package. Quantitative variables were summarized using mean and standard deviation, while qualitative variables were summarized using frequencies and percentages. Frequency distribution tables were constructed; and cross tabulations were done to examine the relationship between categorical variables. Binary logistic regression analysis was used to determine the predictors of overweight and obesity. All levels of significance were set at $p < 0.05$.

Ethical Consideration

Institutional ethical clearance was obtained from the Research and Ethics Committee of Sokoto State Ministry of Health, Sokoto, Nigeria. Permission to conduct the study was obtained from the authorities of the selected LGAs, and informed consent was obtained from the participants before commencing questionnaire administration.

RESULTS

Socio-demographic characteristics of respondents

A total of 215 questionnaires each were administered to the respondents in the urban and rural groups. All the questionnaires administered in both groups were completely filled, returned and analyzed (giving a response rate of 100%). A larger proportion of the respondents in the urban group 58 (27.0%) were aged 26-35 years whereas, a larger proportion of the respondents in the rural group 50 (23.3%) were aged 36-45 years, but there was no significant difference ($p > 0.05$) in the age distribution of both groups. The rural group had a significantly higher proportion ($p < 0.05$) of males (rural = 74.0%; urban = 58.6%), Hausas (rural = 92.6%; urban = 58.1%), and Muslims (rural = 99.1%; urban = 72.6%). Whereas, the majority of the respondents in the urban group had tertiary education 128 (59.5%), a larger proportion of the respondents in the rural group had only Quranic education. A significantly higher proportion ($p < 0.05$) of respondents in the urban group gave a family history of overweight or obesity as compared to those in the rural group (urban = 25.1%; rural group = 16.7%) [Table 1].

Prevalence of overweight and obesity among respondents

There was a higher proportion of respondents with overweight in the urban group 48 (22.3%) as compared to the rural group 38 (17.7%) but the difference was not statistically significant ($p > 0.05$). There was a statistically significant higher proportion of respondents with

obesity in the urban group 52 (24.2%) as compared to the rural group 16 (7.4%); $\chi^2 = 34.141$, $p < 0.001$ (Figure 1).

Respondents' dietary habits

About two-thirds of respondents in both groups usually eat fatty foods (urban = 62.8%; rural = 61.9%), and also eat fruits at least 1-3 days per week (urban = 61.9%; rural = 56.3%). Only about half of respondents in both groups eat vegetables 1-3 days per week (urban = 50.7%; rural = 54.9%). There was no significant difference ($p > 0.05$) in the dietary habits of the respondents in both groups (Table 2).

Respondents' physical activity profile

A significantly higher proportion ($p < 0.05$) of the rural group respondents as compared to the urban group respondents trek to work (rural = 73.0%; urban = 46.0%), and their work schedule involves moderate intensity exercise (rural = 89.3%; urban = 62.8%) in about 4-7 days per week (rural = 75.0%; urban = 52.2%). Similarly, a significantly higher proportion ($p < 0.05$) of the rural group respondents as compared to the urban group respondents engage in moderate-intensity sport, fitness and recreational activities (rural = 77.2%; urban = 67.4%) in about 4-7 days per week (rural = 77.7%; urban = 39.1%) [Table 3].

Predictors of overweight and obesity among respondents

There were variations in the predictors of overweight and obesity among the respondents in the rural and urban groups. Whereas, the predictors of overweight and obesity among the rural group respondents were marital status, average monthly income, and dietary habits, the predictors of overweight and obesity among the urban group respondents were exercise profile and family history of overweight and obesity.

Among the rural group respondents, those that were married were about 5 times more likely to be overweight or obese (aOR: 4.860; 95% CI: 1.396 – 16.940; $p = 0.013$) as compared to those in the other marriage categories. Respondents that earn \leq ₦30000 monthly were about 3 times more likely to be overweight or obese (aOR: 3.365; 95% CI: 1.355 – 8.371; $p = 0.009$) as compared to those that earn $>$ ₦30000 monthly. Respondents that usually eat fatty food were about 7 times more likely to be overweight or obese (aOR: 7.338; 95% CI: 1.630 – 33.025; $p = 0.009$) as compared to those who do not.

Among the urban group respondents, those who do not engage in moderate-intensity sport, fitness or recreational activities were about 4 times more likely to be overweight or obese (aOR: 3.839; 95% CI: 1.141 – 10.445; $p = 0.008$) as compared to those who do so. Also, respondents who gave a family history of overweight or obesity were about 4 times more likely to be overweight or obese (aOR: 3.715; 95% CI: 1.320 – 10.453; $p = 0.013$) as compared to those who did not (Table 4).

DISCUSSION

The study assessed the prevalence and predictors of overweight and obesity in urban and rural communities of Sokoto Northwestern Nigeria. Both overweight and obesity were more prevalent in the urban group in this study. Although, the prevalence of overweight in the urban group (22.3%) and the rural group (17.7%) was not significantly different, obesity was significantly more prevalent in the urban group (24.2%) as compared to the rural group (7.4%). This finding is not surprising in view of the fact that whereas there was no significant difference in the dietary habits of the respondents in both groups in which about two-thirds of the respondents in both groups eat fatty foods (urban = 62.8%, rural = 61.9%), a significantly higher proportion ($p < 0.05$) of the respondents in the rural group as compared to the urban group were engaged in physical activities including trekking to work, their work schedule involving moderate intensity exercise, and by engaging in moderate intensity sport, fitness and recreational activities.

The finding in this study is consistent with the finding of the Nigeria Demographic and Health Survey 2018²⁴ that reported a higher prevalence of overweight or obesity in urban areas (36.0%) as compared to rural areas (21.0%). Similar to the finding in this study, Adeloje et al.¹³ found the prevalence of overweight and obesity to be higher among urban dwellers (overweight = 27.2%, obesity = 14.4%) as compared to rural dwellers (overweight = 16.4%, obesity = 12.1%). Disparities in obesity prevalence rates in urban and rural communities have been reported in a number of studies, with urban communities having higher prevalence rates as compared to rural communities. It is believed that the interplay of socio-cultural lifestyle, high physical inactivity, high caloric energy intake and environmental factors may have contributed to the higher prevalence of obesity observed among the residents of urban communities as compared to their rural counterparts who majorly live an agrarian lifestyle.^{1,23}

Table 1: Socio-demographic characteristics of respondents

Variables	Urban group (n = 215) Frequency (%)	Rural group (n = 215) Frequency (%)	Test of significance
Age groups (years)			
18-25	53 (24.7)	42 (19.5)	$\chi^2 = 8.529,$ $p = 0.130$
26-35	58 (27.0)	46 (21.4)	
36-45	45 (20.9)	50 (23.3)	
46-55	34 (15.8)	33 (15.3)	
56-65	14 (6.5)	28 (13.0)	
≥66	11 (5.1)	16 (7.4)	
Sex			
Male	126 (58.6)	159 (74.0)	$\chi^2 = 11.331,$ $p = 0.001^*$
Female	89 (41.4)	56 (26.0)	
Marital status			
Single	63 (29.3)	51 (23.7)	Fisher's exact, $p = 0.097$
Married	129 (60.0)	147 (68.4)	
Separated	4 (1.9)	1 (0.5)	
Divorced	6 (2.8)	1 (0.5)	
Widowed	13 (6.0)	15 (7.0)	
Ethnicity			
Hausa	125 (58.1)	199 (92.6)	$\chi^2 = 73.489,$ $p < 0.001^*$
Fulani	23 (10.7)	10 (4.7)	
Igbo	14 (6.5)	2 (0.9)	
Yoruba	29 (13.9)	1 (0.5)	
Others	24 (11.2)	3 (1.4)	
Religion			
Islam	156 (72.6)	213 (99.1)	$\chi^2 = 62.027,$ $p < 0.001^*$
Christianity	59 (27.4)	2 (0.9)	
Education			
None	14 (6.5)	24 (11.2)	$\chi^2 = 69.944,$ $p < 0.001^*$
Quranic	30 (14.0)	98 (45.6)	
Primary	8 (3.7)	14 (6.5)	
Secondary	35 (16.3)	20 (20.6)	
Tertiary	128 (59.5)	59 (15.5)	
Occupation			
Student	18 (8.4)	11 (5.1)	$\chi^2 = 11.393,$ $p = 0.010^*$
Trading/Business	109 (50.7)	142 (66.0)	
Civil servant	76 (35.3)	50 (23.3)	
Others (e.g., pension)	12 (5.6)	12 (5.6)	
Average monthly income (Naira)			
≤30000	101 (51.5)	154 (75.1)	$\chi^2 = 24.086,$ $p < 0.001^*$
>30000	95 (48.5)	51 (24.9)	
Family history of overweight or obesity			
Yes	54 (25.1)	36 (16.7)	$\chi^2 = 4.553,$ $p < 0.043^*$
No	161 (74.9)	179 (83.3)	

χ^2 = Pearson's Chi-square test; *Significant ($p < 0.05$)

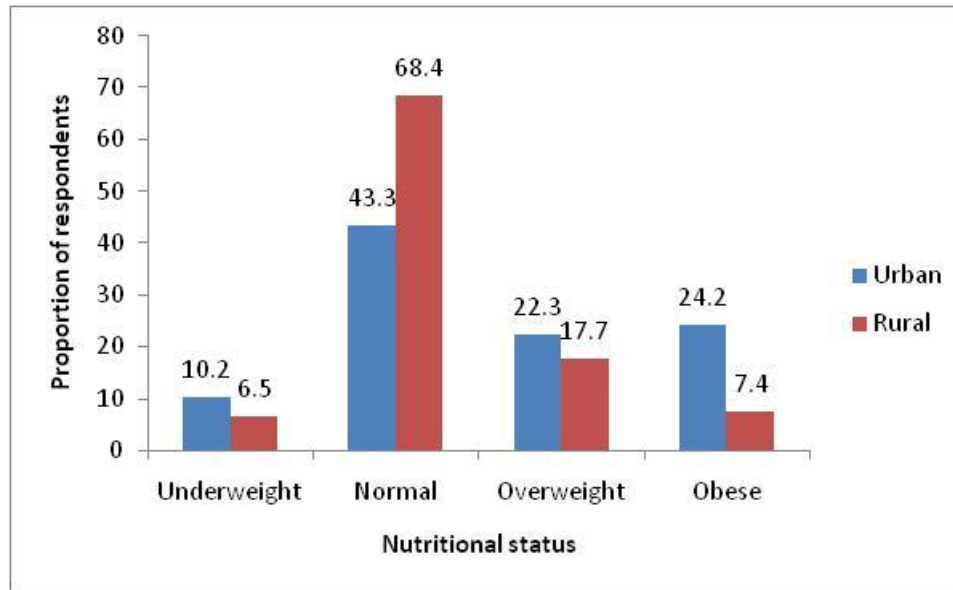


Figure 1: Prevalence of overweight and obesity among respondents

Table 2: Respondents' dietary habits

Variables	Urban group (n = 215) Frequency (%)	Rural group (n = 215) Frequency (%)	Test of significance
Usually eat fatty food			
Yes	135 (62.8)	133 (61.9)	$\chi^2 = 0.040$, p = 0.921
No	80 (37.2)	82 (38.1)	
Number of days per week eat fruit			
Not at all	6 (2.8)	11 (5.1)	$\chi^2 = 2.752$, p = 0.253
1-3	135 (62.8)	121 (56.3)	
4-7	74 (34.4)	83 (38.6)	
Number of days per week eat vegetable			
Not at all	4 (1.9)	12 (5.6)	$\chi^2 = 5.902$, p = 0.052
1-3	109 (50.7)	118 (54.9)	
4-7	102 (47.4)	85 (39.5)	

χ^2 = Pearson's Chi-square test

Also, the residents of urban communities have more access to fast foods and high energy drinks, they are more at risk of physical inactivity as they have less space for leisure exercise in the overcrowded cities where they live, and mostly use automobiles for transportation as compared to the residents of rural communities who usually trek to their farms and working places.^{1,23}

In this study being married, average monthly income less than N30,000:00, frequent consumption of fatty foods were the predictors of overweight/obesity in the rural group, while not engaging in moderate intensity sport, fitness or recreational activities and family history of overweight/obesity were the predictors of overweight/obesity in the urban group.

Table 3: Respondents' physical activity profile

Variables	Urban group (n = 215) Frequency (%)	Rural group (n = 215) Frequency (%)	Test of significance
Method used in getting to work			
Trek to work	99 (46.0)	157 (73.0)	$\chi^2 = 45.604,$ $p < 0.001^*$
Ride a pedal bicycle	4 (1.9)	12 (5.6)	
Ride a motorcycle	63 (29.3)	30 (14.0)	
Ride in a car	49 (22.8)	16 (7.4)	
If trek to work, number of days per week			
≤3	39 (39.4)	76 (48.4)	$\chi^2 = 1.994,$ $p = 0.197$
≥4	60 (60.6)	81 (51.6)	
If ride a pedal bicycle, number of days per week			
≤3	3 (75.0)	10 (83.3)	Fisher's exact, $p = 0.607$
≥4	1 (25.0)	2 (16.7)	
Work involves moderate intensity exercise			
Yes	135 (62.8)	192 (89.3)	$\chi^2 = 41.497,$ $p < 0.001^*$
No	80 (37.2)	23 (10.7)	
Number of days per week involved in moderate intensity exercise as part of work			
1-3	64 (47.8)	48 (25.0)	$\chi^2 = 18.129,$ $p < 0.001^*$
4-7	70 (36.6)	144 (75.0)	
Engage in moderate intensity sport, fitness or recreational activities			
Yes	145 (67.4)	166 (77.2)	$\chi^2 = 5.124,$ $p = 0.024^*$
No	70 (36.6)	49 (22.8)	
Number of days per week engaged in moderate intensity sport, fitness or recreational activities			
1-3	98 (60.9)	37 (22.3)	$\chi^2 = 50.186,$ $p < 0.001^*$
4-7	63 (39.1)	129 (77.7)	

χ^2 = Pearson's Chi-square test; *Significant ($p < 0.05$)

The finding of the married respondents being almost 5 times more likely to be overweight or obese as compared to those in the other categories among the respondents in the rural communities in this study is consistent with the finding in a study conducted in Jos, Nigeria³⁰ in which the married individuals were 4 times more likely to be overweight/obese as compared to the non-married. Similarly, previous studies by Chan et al⁵ and Munyogwa and Mtunwa⁷ also found that respondents

who were married were more than 3 times more likely to be obese than those that were not married. It is believed that married men and women are less likely to be conscious of, or concerned about their body weight, and as such, they are more likely to experience a greater weight gain as compared to non-married individuals who are attempting to minimize weight gain in order to attract a partner.³¹

Table 4: Predictors of overweight and obesity among respondents

Variables	Urban group				Rural group			
	aOR	95% CI		p-value	aOR	95% CI		p-value
		Lower	upper			Lower	upper	
Marital status (*Married vs single / separated / divorced / widowed)	--	--	--	--	4.860	1.396	16.940	0.013**
Average monthly income (≤₦30000 vs >₦30000)	--	--	--	--	3.365	1.355	8.371	0.009**
Usually eat fatty foods (*Yes vs No)	--	--	--	--	7.338	1.630	33.025	0.009**
Engage in moderate-intensity sport, fitness or recreational activities (*No vs Yes)	3.839	1.141	10.445	0.008**	--	--	--	--
Family history of overweight or obesity (*Yes vs No)	3.715	1.320	10.453	0.013**	--	--	--	--

aOR = adjusted Odds Ratio; CI = Confidence Interval; * Reference group; **Significant (p < 0.05)

Also, marital roles appear to influence fatness and obesity among couples as they share similar behavior including dietary habits. A study suggests that, with the increase in income, the intake of higher energy and fat, and consumption of animal and processed foods increases, all of which are associated with overweight and obesity.³² Married individuals tend to have less time for physical exercise, in addition to exhibiting cultural attitudes to affluence and desire for weight gain (especially among women, as it is often perceived as a sign of affluence); these could also have contributed to the emergence of being married as a predictor of overweight and obesity in this study.

The finding of a relatively low average monthly income being a predictor of overweight or obesity in this study with those who earn ≤₦30,000:00 being 3 times more likely to be overweight or obese as compared to those who earn >₦30,000:00 per month is in consonance with the finding in a study by Iwuala et al.²⁰ in which persons with lower monthly income of less than ₦200,000 were almost 3 times more likely to be obese as compared to individuals who earn ≥₦200,000. A plausible explanation for the association between low income and obesity in this study and the later study is the fact that low-income earners may not be able to afford healthy foods, and as such resort to junk foods which are

unhealthy and predisposed them to overweight and obesity. This is further supported by the finding of respondents who usually eat fatty foods being about 7 times more likely to be overweight or obese as compared to those who do not among the rural group respondents in this study. This is in agreement with the findings in previous studies which reported a direct relationship between eating excessive fatty diet and being overweight/ obesity.^{33,34}

The emergence of low income and unhealthy diets as predictors of overweight and obesity in the rural communities in this study and the inextricable link between them is of serious concern as it brings to the fore the consequences of the inequalities in access to education and means of livelihood in the urban and rural populations of Sokoto State with significant differences in education and income. Whereas, about two-thirds (59.5%) of the respondents in the urban communities had tertiary education, less than a fifth (15.5%) of those in the rural communities had tertiary education. Also, whereas, close to half of the respondents in the urban area earn >₦30,000:00 per month, only about a quarter (24.9%) of those in the rural area earn >₦30,000:00 per month. It is therefore imperative for government to pay sufficient attention to the socio-economic development of the rural communities in the state to make them

economically productive, empower them to be able to afford healthy diets, and reverse the high prevalence of overweight and obesity in the state.

The finding of sedentary lifestyle being a predictor of overweight and obesity among the respondents in the urban communities in the state with those who do not engage in moderate intensity sport, fitness or recreational activity being about 4 times more likely to be overweight/ obese as compared to those who do so is in agreement with the findings in previous studies by Topara et al.,² and Chan et al.,⁵ which reported an inverse relationship between the level of physical activities and the risk of overweight and obesity. The finding in this study and the latter studies are not surprising because physical activity is known to cause elevation in daily energy expenditure, and it also increases the resting energy that is needed to promote fat oxidation which in turn decreases the body fat mass.

Also, the finding of family history of overweight/obesity being a predictor of overweight and obesity among the residents of the urban communities in this study with individuals with family history of overweight or obesity being about 4 times more likely to be overweight and obese compared to those without is consistent with the finding in a previous study by Omuemu and Omuemu.³⁵ It is believed that obesity could have a genetic component as it is known to run in families, and effective familial studies have shown a high correlation between BMI and parental obesity.³⁶ These findings underscore the need for the Sokoto State government to target “at risk individuals” (i.e., those with family history of overweight and obesity), particularly in the urban communities in the state, for weight control interventions.

CONCLUSION

This study showed high prevalence of overweight and obesity among adults in urban and rural communities of Sokoto State, Nigeria, but it was significantly higher in the urban communities as compared to the rural communities. Whereas, the predictors of overweight / obesity in the rural group were being married, average monthly income <N30,000:00 and consumption of fatty foods; the predictors of overweight / obesity in the urban group were not engaging in moderate intensity sport, fitness or recreational activities, and family history of overweight and obesity. These findings underscore the need for the Ministry of Health, Sokoto State, Nigeria to organize sensitization campaigns through the mass media to create awareness on the prevention and

control of overweight and obesity among the residents in the state. In addition, the Sokoto State Government should make poverty alleviation and provision of sports and recreation facilities in workplaces top priorities.

Acknowledgments

The authors appreciate all the respondents that participated in the study.

Source of support

Nil.

Conflict of interest

None declared.

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How to cite this article: Akogwu HS, Oche MO, Awosan KJ, Anas S, Adamu IA, Bwanhwat NJ. Prevalence and predictors of overweight and obesity among adults in rural and urban communities of Sokoto State, Nigeria. *Int Arch Med Health Res* 2021; 2(2): 19-28.

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