

NUTRITIONAL STATUS AND UMBILICAL HERNIA IN NIGERIAN SCHOOL CHILDREN OF DIFFERENT ETHNIC GROUPS

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The relationship between nutritional status and umbilical hernia was assessed among Hausa and Yoruba school children in rural areas of Kwara State, Nigeria. The prevalence of umbilical hernia in the rural school pupils was 19.4%. The Yoruba school children had a higher prevalence rate of 22.0%, while the prevalence rate for Hausa pupils was 16.9%. The association between umbilical hernia and primary school class was statistically significant. More school children suffering from protein energy malnutrition presented with umbilical hernia. The association between umbilical hernia and nutritional status was weak. The school health component of the national primary health program should be intensified to screen school children regularly for umbilical hernia. The school health environment of rural Nigerian schools should be improved through government efforts. (*J Natl Med Assoc.* 1991;83:905-909.)

Key words • nutritional status • umbilical hernia
• Nigerian children

Recently, two social programs were introduced by the Nigerian federal government: the Universal Free Primary Education (UPE) and the national Primary Health Care (PHC) programs. The goal of the PHC program, which was established in 1975, was to initiate a comprehensive health-care plan for all Nigerians. In an effort to extend educational facilities to Nigerian

rural communities, the UPE program was established in 1976. As a result of the UPE program, most children who previously lived on farms that were medically and educationally isolated were enrolled in primary schools. To meet the educational needs of the pupils, more teachers were recruited and trained. In addition, more secondary and post-secondary schools were established.

Although educational programs have now been introduced to increasing numbers of rural communities, the infrastructural facilities required for organizing effective school health programs are grossly inadequate. In most rural Nigerian schools, pupils are exposed to a broad spectrum of parasitic and viral diseases.^{1,2} Because of poverty and ignorance, school children often learn in a sordid environment. In Nigeria and other developing African countries, little or no attention is paid to providing adequate health services or proper health instruction in an environment that promotes healthful living.

Recent studies conducted in different parts of Nigeria indicated that the majority of rural school children are undernourished with enough multiple parasitic infections to interfere with the children's physical growth.^{1,3} Many of these undernourished school children have protruding umbilical hernias. Several comparative studies have revealed a higher prevalence of umbilical hernia in children of African descent than in their white American counterparts.⁴⁻⁶ Jelliffe⁷ attributed the high prevalence of umbilical hernia among rural Nigerian school children to inherited physiological characteristics, protein energy malnutrition (PEM), sordid environment, and inadequate medical care.

Therefore, the study described in this article was designed to:

- compare the nutritional status of Hausa and Yoruba school children in rural areas of Kwara State, Nigeria,
- determine the relationship between nutritional status

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Figure 1. Typical umbilical hernias in Nigerian rural school children.

and umbilical hernia among the two groups of Nigerian pupils, and

- examine the relationship between gender and umbilical hernia.

METHOD

Two rural communities in Kwara State, Nigeria were randomly selected as the study sites. The selected communities were Bode Saadu and Jebba, a border village separating Kwara and Niger State. Students at two zonal education board (ZEB) primary schools were randomly selected as study participants. In Bode Saadu, 567 school children (312 males and 255 females) were screened, and the same number of children (567; 337 males and 230 females) were also screened in Jebba. Jebba and Bode Saadu are 90 km and 70 km, respectively, from Ilorin, the capital of Kwara State.

Study participants were stratified by ethnic descent and fell into two of the four major ethnic groups in Nigeria: the Hausas and the Yorubas. These two groups comprise up to 21.0% and 20.4% of the national population, respectively. In Bode Saadu, more than 90% of the inhabitants were Yorubas, and less than 5% of the school children were members of the other ethnic groups. About 21% of Nigerians reside in urban areas while the remaining 79% dwell in rural areas.

Three paid research assistants, and two field workers of Hausa and Yoruba ethnic descent were recruited at Bode Saadu and received a month of training at the Epidemiology and Community Health Laboratory of the University of Ilorin. They were instructed in techniques for taking weight, height, head, chest, and mid- and upper-arm circumference measurements.

A nutrition education component of PHC was taught to the field workers to facilitate patient education and

TABLE 1. PREVALENCE OF UMBILICAL HERNIA BY GENDER AND ETHNIC GROUP AT TWO NIGERIAN RURAL SCHOOLS

School	Ethnic Group	No. Examined	No. With Umbilical Hernia (%)
Bode Saadu	Yoruba	M 312	87 (27.9)
		F 255	38 (4.9)
Jebba	Hausa	M 337	65 (19.3)
		F 230	31 (13.5)
Total		1134	221 (19.4)

referral of patients found to be suffering from growth deficits or ruptured hernias. The research assistants and the investigators took all the measurements at the two rural schools. The height, weight, and mid-upper-arm circumferences were measured as described by Jelliffe.⁸ Most of the school children at the two rural communities had no birth certificates; therefore, their ages were estimated using historical calendars. A total of 1134 rural school children were screened in both communities.

Detailed epidemiological and clinical investigations were carried out on the children. Using the diagnostic criteria of Schaffer et al,⁹ Cullen,¹⁰ and Oduntan,⁴ umbilical hernia was considered clinically evident if:

- the hernia was large enough to admit the index finger or measured up to 5 cm in diameter,
- the sac contained a loop of bowel from which a quantity of air could be squeezed back into the abdomen, or
- an umbilical protrusion was present that transmitted an impulse on coughing and could be suppressed by applying simple pressure through a gap in the umbilicus (Figure 1).

RESULTS

Table 1 summarizes the prevalence of umbilical hernia among Hausa and Yoruba rural school children. The prevalence of umbilical hernia in the rural school children was 19.4%. Yoruba male school children had the highest prevalence rate (27.9%), followed by Hausa male children with a 19.3% prevalence rate. However, no significant association was found between the incidence of umbilical hernia and gender ($\chi^2 = .09$; $df = 1$; $P > .05$).

Table 2 presents the prevalence of umbilical hernia by grade distribution among rural school children. At

TABLE 2. PREVALENCE OF UMBILICAL HERNIA BY PRIMARY GRADE AT TWO NIGERIAN RURAL SCHOOLS*

School	Grade 1 (%)	Grade 2 (%)	Grade 3 (%)	Grade 4 (%)	Grade 5 (%)	Grade 6 (%)
Bode Saadu (Yoruba)	30 (5.3)	46 (8.1)	27 (4.8)	9 (1.6)	11 (1.9)	2 (0.4)
Jebba (Hausa)	49 (8.6)	7 (1.2)	14 (2.5)	9 (1.6)	10 (1.8)	7 (1.2)
Total	79 (6.9)	53 (4.6)	41 (3.6)	18 (1.6)	21 (1.9)	9 (0.8)

* $\chi^2=37$; $df=5$; $P<.001$.

TABLE 3. PREVALENCE OF UMBILICAL HERNIA BY AGE GROUP AT TWO NIGERIAN RURAL SCHOOLS*

School	5 Years Old (%)	6 to 7 Years Old (%)	8 to 9 Years Old (%)	10 to 11 Years Old (%)	12 to 13 Years Old (%)	14 to 15 Years Old (%)
Bode Saadu (Yoruba)	21 (3.7)	52 (9.1)	31 (5.4)	9 (1.6)	9 (1.6)	3 (0.5)
Jebba (Hausa)	41 (7.2)	32 (5.6)	7 (1.2)	10 (1.8)	2 (0.4)	4 (0.7)
Total	62 (5.5)	84 (7.4)	38 (3.4)	19 (1.7)	11 (0.9)	7 (0.6)

* $\chi^2=6.804$; $df=5$; $P>.05$.

the two schools, pupils in grades one through three had the highest frequency of umbilical hernia (15.3%) while the prevalence for pupils in grades four through six was only 4.2%. The association between umbilical hernia by age among Hausa and Yoruba school children can be found in Table 3. The highest proportion of Yoruba rural school children with umbilical hernia were those in the 6- to 7-year-old age group. Also, Hausa school children aged 5 had the highest prevalent rate in that ethnic group. The lowest prevalent rates were observed among the 12- to 15-year-old age group. No statistical significance was found between umbilical hernia and age ($\chi^2=6.804$; $df=1$; $P>.05$).

The prevalence of umbilical hernia by parental occupational status is summarized in Table 4. Hausa school children born to civil servants and farmers had high prevalence rates of 21.8% and 21.6%, respectively. Their Yoruba counterparts born to traders and artisans had prevalence rates of 41.4% and 34.4%, respectively. Statistical significance was found between umbilical hernia and parental occupation ($\chi^2=23.033$; $df=4$; $P<.001$).

Jelliffe⁸ developed a universally accepted reference technique for classifying individuals into three groups of nutritional status—moderate, mild, and normal nutrition.¹¹ This sensitive technique for detecting and classifying malnutrition among school children includes Quetelet's index, which is calculated from weight:height² ratio. As presented in Table 5, this approach, which is independent of age, was used to

classify the nutritional status of the Hausa and Yoruba school children at the two rural primary schools in Kwara State.

The weight:height² ratio identified 29.1% and 12% of the Hausa male and female pupils, respectively, to be moderately malnourished while 29.8% and 23.5% of their Yoruba counterparts, male and female school children, respectively, were moderately malnourished. Among the moderately malnourished Hausa pupils, 3.4% had umbilical hernia. The moderately malnourished Yoruba school children with umbilical hernia were 5.1%. At Jebba, where Hausa pupils were screened, 13.1% of the male and 9.5% of the female children were mildly malnourished whereas at Bode Saadu, the Yoruba pupils who were mildly malnourished encompassed 5.6% of the male and 3.4% of the female children, respectively. Among the Hausa school children, 17.8% of the males and 19% of the females were well-nourished, compared with 5.8% male and 8.6% female Yoruba students. Less than 2% of the well-nourished children in both ethnic groups had umbilical hernia. The statistical significance between nutritional status and umbilical hernia was slight ($\chi^2=4.5$; $df=2$; $P<.1$).

Of all the school children screened, only one 9-year-old boy had a ruptured hernia and was referred to a surgeon for treatment. Five Yoruba school children also complained of excruciating pain whenever the umbilical hernia was slightly pressed with the index finger.

TABLE 4. PREVALENCE OF UMBILICAL HERNIA BY PARENTAL OCCUPATION AT TWO NIGERIAN RURAL SCHOOLS*

Occupation of Parents	Hausa School Children (Jebba)		Yoruba School Children (Bode Saadu)		Total No. With Umbilical Hernia (%)
	No. Examined	No. With Umbilical Hernia (%)	No. Examined	No. With Umbilical Hernia (%)	
Farmers	176	38 (21.6)	231	51 (22.1)	89 (21.8)
Artisans	6	1 (16.7)	32	11 (34.4)	12 (31.5)
Civil servants	147	32 (21.8)	258	49 (18.9)	81 (20)
Traders	51	8 (15.7)	29	12 (41.4)	20 (25.0)
Meat butchers	187	17 (9.1)	17	2 (11.8)	19 (9.3)
Total	567	96 (16.9)	567	125 (22.0)	221 (19.5)

* $\chi^2 = 23.033$; $df = 4$; $P < .001$.

TABLE 5. CLASSIFICATION OF NUTRITIONAL STATUS OF HAUSA AND YORUBA SCHOOL CHILDREN BY WEIGHT:HEIGHT² RATIO AND OCCURRENCE OF UMBILICAL HERNIA BY GENDER

Weight:Height ² Ratio	Sex	Moderate Malnutrition		Mild Malnutrition		Normal Nutrition	
		No. Examined	No. With Umbilical Hernia	No. Examined	No. With Umbilical Hernia	No. Examined	No. With Umbilical Hernia
Hausa School Children							
0.00126-0.00138	M	162	32	—	—	—	—
	F	68	7	—	—	—	—
0.00139-0.00156	M	—	—	74	29	—	—
	F	—	—	54	22	—	—
>0.00156	M	—	—	—	—	101	4
	F	—	—	—	—	108	2
Total		230 (40.5)	39 (3.4)	128 (22.5)	51 (4.5)	209 (36.8)	6 (0.5)
Yoruba School Children							
0.00126-0.00138	M	169	44	—	—	—	—
	F	133	14	—	—	—	—
0.00139-0.00156	M	—	—	110	32	—	—
	F	—	—	73	19	—	—
>0.00156	M	—	—	—	—	33	11
	F	—	—	—	—	49	5
Total		302 (53.2)	58 (5.1)	183 (32.2)	51 (4.5)	82 (14.4)	16 (1.4)

DISCUSSION

No previous study assessing the relationship between nutritional status and umbilical hernia among rural school children in Kwara State was found in the literature. In neighboring Oyo State, Oduntan⁴ reported a 25.3% prevalence rate among 1306 urban and rural school children. In her study, 39.2% and 42.6% of rural and illiterate children, respectively, presented with umbilical hernia. Upper-class children had a prevalence

rate of 8.6% while the other school pupils with umbilical hernia were 27.3%. This observation of Oduntan's is only comparable to the prevalence rate found in the Yoruba male school children in this sample. This is not surprising because the majority of the subjects in Oduntan's study were of Yoruba ethnic descent.⁴ Hausa school children who presented with umbilical hernia were 19.3%.

Although a higher proportion of the pupils in the 6-

to 7-year-old age group presented with the condition, there was no association between age and umbilical hernia. However, a statistically significant association was found between umbilical hernia and primary school grade. Some investigators have theorized that the umbilical hernias seen in primary school pupils heal with age. As a result, a lower frequency of hernias is seen in high school students.^{4,6,7}

As shown in Table 4, the association between parental occupation and status and umbilical hernia was statistically significant. The lowest proportion of school children with umbilical hernia among both ethnic groups were those born to (meat) butchers. This observation corroborates the findings of Jelliffe,⁷ who maintained that an excessively high carbohydrate diet, poor prenatal and natal care, protein energy malnutrition, and a sordid environment can increase the frequency of umbilical hernia in rural school children. Other investigators have found that environmental factors figure significantly in the prevalence of umbilical hernia.^{4,6}

In this study, environmental influences could not be assessed because the children in the two study groups were all rural dwellers. However, the elite children in Oduntan's inquiry had a low prevalence rate of 8.6%.⁴ A 2% prevalence rate has been found in British children, and umbilical hernia has been reported to be 30% more common in Africans than in Afro-American children in each age group.^{4,6,12}

By using Quetelet's index (weight:height² ratio), it was determined that children with umbilical hernia suffered more from PEM than children who did not have the condition. The high proportion of umbilical hernia among school children in rural Nigeria is due not only to PEM, but also to inherited physiological characteristics, inadequate medical care, and living in an unhygienic environment.^{4,7}

IMPLICATIONS FOR SCHOOL HEALTH PROGRAMS

The typical rural school (Figure 2) in Nigeria is not equipped with adequate facilities for environmental hygiene, periodic screening services, or treating unplanned health hazards.

Because of the high proportion of children with umbilical hernia in rural primary schools in Nigeria, strangulated hernia is one of the fears of parents. Such acute abdominal catastrophes that necessitate surgical attention can be stemmed only if there is effective medical referral of school children to tertiary health institutions. The various local, state, and federal health

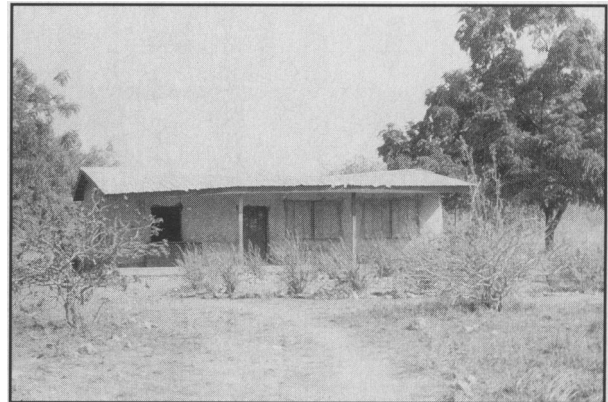


Figure 2. A typical school building in Nigerian rural communities.

authorities should encourage health institutions to screen rural school children for umbilical hernia. The screening of school children for various health problems needs to be an essential feature of the school health component of the Nigerian Primary Health Care program.

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