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# Prevalence of scoliosis in secondary school children in Osogbo, Osun State, Nigeria

MS Jenyo and\*EO Asekun-Olarinmoye

Departments of Surgery, Orthopeadic Unit, and \*Community Medicine, LAUTECH Teaching Hospital, Osogbo, Osun State, Nigeria

#### Summary

In order to determine the prevalence and distribution of various parameters associated with scoliosis in school children in Osogbo, Osun State, Nigeria, a two-year prospective study was carried out. The study was carried out in selected secondary schools in Osogbo township, Osun state, Nigeria. A team consisting of one consultant orthopeadic surgeon, one consultant epidemiologist, community health consultant, two laboratory scientists and one clerk performed the school screening. Simple random sampling was used to select the study population. Informed consent was obtained from the school principals, the students, and the parents of the students. A total of 410 children 190(46.3%) males and 220(53.7%) females aged 9-14 years old were screened. Thirty (7.31%) children had signs of scoliosis but only five (1.21%) had radiological evidence of scoliosis. Prevalence of scoliosis in the study group was 1.2%. A sensitive test for detection of scoliosis was forward bending test. Thoracic curve was most common. Cost of screening was affordable. School screening is simple, and cost effective. This study found that scoliosis is not common in school children in Osogbo, Osun state, Nigeria and therefore does not pose as a major public health problem. However, all the children who had radiological evidence of scoliosis were not aware of this prior to the screening exercise. Early detection has implication for choice of management - an advantage of the screening programme.

**Keywords**: Prevalence, scoliosis, school children, screening.

#### Résumé

Une ètude prospective de 2 ans ètait faite dans des collèges selectionnès pour determiner la prevalence et la distribution des diffèrent parametres associès a la scoliose parmi les collègiens a Osogbo dans l'ètat d'Osun au Nigèria.L'ètude ètait faite par une èquipe mèdicale complète avec le consentement obtenu de chaque collegien, du parent et de leurs principals. Au total 410 collègiens, 190(46.3% des garcons et 220(53.7%) des filles agès de 9 a 14 ans ètaient examinès. 7.31% avaient des signes de la scoloiose mais seule 1.21% avaient une evidence radiolo

Correspondence: Dr. M.S. Jenyo, P.O. Box 1105, Osogbo, Osun State, Nigeria. E-mail: jenyoms@yahoo.com.

gique. Le taux de la scoloiose ètait de 1.2% dans cette ètude. Un test de sensitivité pour la dètection de la scoliose ètait la courbature droite dèbout, simple et a cout moyen. La courbe thoracique ètait commune. Cette ètude demontrait que la scoliose n'est pas commune chez les ècoliers a Osogbo, cependant ceux ayant eu une èvidence radiologique de la scoliose n'avaient aucune information de leur ètat physique. Une dètection prècose aura des implications dans le choix des soins, et demontrant ainsi l'avantage des programmes de dèpistage.

#### Introduction.

Scoliosis is a three dimensional problem composed of torsion, angulations and translation simultaneously occurring in the transverse, coronal and sagittal planes. Although several procedures for operative and non-operative treatment of scoliosis have evolved, the most effective treatment is still based on early detection [1,2,3]. There has been several reports on early detection of scoliosis [1,2,4]. In this regard, school screening is considered a powerful tool that can be used to identify children who may have scoliosis as well as those who may be at high risk for the disease [5]. The important benefits and advantages of school-screening program for scoliosis include the identification of a large number of previously undiagnosed curves, the identification of children who are at high risk for progression and a decrease in the number of operative procedures that will be performed in children due to early detection and prompt management [6]. The most widely used method of early detection is the forward bending test developed by Adams yet its effectiveness in school screening has been questioned [7,8,9]. The minimum angle of curvature to qualify as scoliosis ranges from  $5^{0}$ - $10^{0}$  [4]. For this study, scoliosis was taken as a curve of 5° or more. A total of 410 children were screened in secondary schools in Osogbo, Nigeria. References on similar work done in Nigeria in the past were not found in indexed journals.

# Subjects and methods

#### Study area

Osogbo is the capital of Osun state in southwest, Nigeria. It has a population of about 1.3 million [10] who are mainly "Yorubas".

#### Study design

A two-year prospective epidemiological study was carried out to determine and assess the prevalence and distribution of various scoliotic parameters in school children in Osogbo, Nigeria.

#### Sampling technique and procedure

Study population was obtained by selecting 25% of secondary schools in the locality using simple random sampling method utilizing the ballot method. All children aged 9-14 years in these schools were recruited into the study. Since scoliosis is most common in children 9-14 years of age [6], school children within this age group were screened. Written informed consent was obtained from the school principals, the students, and the parents of the students. Children of the two (2) parents who did not give consent were excluded from the study. The screening team included one consultant Orthopeadic Surgeon, one consultant Epidemiologist, one Community Health consultant, two laboratory scientists, and one clerk. Relevant data were collected from the students utilizing a pre-tested structured questionnaire. Information sought included sociodemographic data, physical attributes of respondents. anthropometric data, and signs of abnormality of spine or trunk. Screening took place in the school during the school hours when the children had free periods or during break time.

The weight of each child was taken using the Salter weighing-scale, height standing, height sitting and arm span were measured. Physical examination were conducted on each child, boys wore own shorts whilst girls wore own shorts and brassieres. Female teachers acted as chaperones during the physical examination for the girls.

The Orthopeadic Surgeon examined each child for any abnormality of spine or trunk. The spine and trunk were examined from the back, noting asymmetry of the shoulders, scapular prominence, rib hump, abnormal loin skin creases, asymmetry of pelvis and buttocks and any shortening of lower limb whilst standing. The spine was examined from the back in an upright position with the spine flexed (Adam's test). In the Adam's forward-bending test, the patient bends forward at the waist with the knees straight and arms together hanging towards the floor and the back parallel to the floor. The examiner looks along the axis of the spine for rotatory asymmetry. Positive signs for scoliosis include asymmetrical shoulder level, scapula prominence, inequality of length of lower limb and asymmetry of spine on forward bending.

Those who had positive signs were sent to LAUTECH Teaching Hospital (LTH), Osogbo, Nigeria for X-ray of Thoraco-lumbar spine (Postero-anterior view standing) and pelvis (antero-posterior view). To rule out bias, the x-ray films were independently reported by the Consultant Radiologist at LTH who was not a member of the research team. The cost of the x-rays was borne by the researchers. Angle of curvature was measured by Cobb's method. The data generated was entered and analyzed using SPSS statistical software computer programme. The results were subjected to appropriate statistical analysis.

#### Results

This report describes the epidemiological findings according to the age and gender of the school children and the magnitude and type of the scoliotic curve. A total of 410 school children { 190 (46.35%) males and 220 (53.65%) females} aged 9-14 yrs were screened from June 2002 to June 2004 (Table 1). The sex ratio was 1:1.2(male/female) and data showed that the females were significantly taller than the males. Thirty (7.31%) children had positive signs of scoliosis (Table 2) but only 5 (1.21%) had radiological evidence of scoliosis with the following magnitude, pattern of curve and type of scoliotic curve: four children (2males and 2 female) had angle of curvature of 1º-9º while one child (male) had angle of curvature of 10°. All five children with radiological evidence of scoliosis were between ages 13 and 14 years. No radiological evidence of scoliosis was found in children 9-12 years of age. The type of scoliotic curve was thoracic in all the five children. No lumbar or thoraco-lumbar curves were seen. Four children had the apex of curve to the left while only one had apex to the right (Table 3).

Table 1: Demographic characteristics of respondents

Personal characteristics	Frequency (%)	
Age		
9yrs	7 (1.7)	
10yrs	6 (1.5)	
llyrs	36 (8.8)	
12yrs	93 (22.2)	
13yrs	158 (38.5)	
14yrs	110 (26.8)	
Total	410 (100.0)	
Sex		
Male	190 (46.3)	
Female	220 (53.7)	
Total	410 (100.0)	

Table 2. Distribution of positive sign for scoliosis

Signs	Yes (%)	No (%)	
Asymmetrical shoulder level	11 (2.7)	399 (97.3)	
Scapular prominence	14 (3.4)	396 (96.6)	
Inequalities of the length of	. ,		
lower limbs	2 (0.5)	408 (99.5)	
Lateral deviation of the spine			
during forward bending test	3 (0.7)	407 (99.3)	

Table 4 shows the distribution of the children according to occurrence of abnormalities of trunk or spine. Eight (2.0%) had humps in the ribs, 5(1.2%) had discrepancies between shoulder levels while 4(1.0%) had deformity of torso (trunk), 4(1.0%) had deformity of spine and 3(0.7%)had humps in lumbar, 3(0.7%) had discrepancies between hips respectively. There was no statistically significant relationship between age, sex, and positive signs of scoliosis. Furthermore, abnormalities of trunk or spine were found to be significantly associated with positive signs for scoliosis.

**Table 3:** Age-Gender distribution of pattern, magni-tude, and apex of curve of scoliosis.

Age	Sex	Degrees of curvature	Apex	Туре
14	F	6 <sup>0</sup>	R	Single Thoracic
13	F	6 <sup>0</sup>	L	Single Thoracic
14	M	8°	L	Single Thoracic
14	M	5°	L	Single Thoracic
13	М	100	L	Single Thoracic

Table 4: Distribution of abnormalities of trunk or spine

Abnormalities	Yes (%)	No (%)	
Humps in Ribs	8 (2.0)	402 (98.0)	
Humps in Lumbar	3 (0.7)	407 (99.3)	
Discrepancies between Shoulders	5(1.2)	405 (98.8)	
Discrepancies between Hips	3 (0.7)	407 (99.3)	
Imbalance of Torso	4 (1.0)	406 (99.0)	
Imbalance of Spine	4 (1.0)	406 (99.0)	

#### Discussion

The incidence of scoliosis in school children in Osogbo, Nigeria was 1.2% (cf 1.7% Greek experience<sup>6</sup>). All curves were thoracic in keeping with findings from Norway and Sweden [4,11] but contrasting with findings from Greece where thoraco-lumbar and lumbar curves were common [6]. The apex of curve left>right (L>R) in this series is in keeping with most findings by other researchers [4,6,11,12]. The degree of rotatory asymmetry in the Adam's position can be measured with an inclinometer (scoliometer). A difference of eight (8) millimeters in height between sides is considered abnormal [13]. This quantitative measurement was however omitted in this series due to the fact that the instrument used for this quantitative measurement (inclinometer) was not available.

The curves in this study were small (all  $10^{\circ}$  and less) with a male preponderance (M:F = 3:2) which is in keeping with findings in other series that documented male preponderance for smaller curves and female preponderance for larger curves [2,3,4,6]. The cost of screening was borne by the researchers. Although the overall cost could not be accurately assessed, it was affordable. In other series, cost was about three cents per child [6]. However, as Ashworth et al stated, all costs and benefits of screening cannot be measured in terms of dollars, subjective benefits must be balanced against objective cost [14]. In this regard, the aim of screening is early diagnosis and application of an appropriate orthotic device in order to decrease the need for an operation. Thus, the effectiveness of a screening program is reflected mainly by a decrease in the number of children who need operative intervention. Therefore, early detection means that cases that would have required surgery would be prevented from getting to that stage by early conservative treatment. To minimize the hazardous effects of irradiation, low dose X-ray was used for screening in one series<sup>15</sup> where progression of curve was found in 14% and where measurement of sacral tilt differentiated compensatory from idiopathic scoliosis. Moreover, posterio-anterior films produce less irradiation to the ovaries in females.

Screening is a useful test in early detection, though school screening has a low positive predictive value (0.05%) [16]. This is highlighted in this series where, whereas thirty(30) children had positive signs of scoliosis only five(5) had radiological evidence.

# Conclusion

This study has shown that scoliosis is not a common public health problem in school children in this environment but we suggest that a more extensive study needs to be undertaken in order to have a true and precise picture of the epidemiology of scoliosis in school children in this environment.

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