

A CONTROLLED STUDY OF BODY MASS INDEX IN KENYAN CHILDREN WITH HEARING DISABILITY

June Njama¹, Gladys Opinya^{2*} and Edith Ngatia³

¹Nyeri County Referral Hospital, Dental Department. P.O. Box 27, Postal Code 10100 Nairobi, Kenya.

²Department of Paediatric Dentistry and Orthodontics, University of Nairobi. P.O. Box 19676, Postal Code 00202 Nairobi, Kenya.

³Department of Paediatric Dentistry and Orthodontics, University of Nairobi. P.O. Box 19676, Postal Code 00202 Nairobi, Kenya.

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*Corresponding Author

Gladys Opinya

Department of Paediatric
Dentistry and Orthodontics,
University of Nairobi. P.O.
Box 19676, Postal Code
00202 Nairobi, Kenya.

ABSTRACT

Poor nutritional status of children with a hearing disability (HD) is of growing interest, as countries with high levels of malnutrition often report higher rates of disability. The study intended to determine the levels of hearing impairment among children aged 5-15 years and compare the body mass index (BMI) of children with and without HD. Eighty-one children had HD (hearing loss ≥ 31 dB in the better ear), and eighty-one children had no HD (hearing loss ≤ 30 dB in the better ear). BMI for age was assessed according to the WHO reference standards for children with HD. Those found to be healthy, underweight, overweight and obese were 56 (69.1%), 18 (22.2%), 6 (7.4%) and 1 (1.3%) respectively. Children without HD who were healthy,

underweight, overweight and obese were 63 (77.8%), 11 (13.6%), 3 (3.7%) and 4 (4.9%) respectively. Children with HD were found to have a higher prevalence of being underweight than children without HD. They were 1.82 times more likely to be underweight ($p=0.15$), and two times more likely to be overweight ($p=0.30$); compared to their non-disabled counterparts. This study concluded that though the differences were insignificant, children with HD were nutritionally disadvantaged compared to children without HD.

KEYWORDS: Hearing; Disability; BMI; Weight; Height.

INTRODUCTION

Nutrition, the processes involved in ingestion and utilisation of foods for growth, maintenance, and repair of the body is a growing area of focus in healthcare medicine today.^[1] Proper nutrition is a prerequisite for the national development of countries and the well-being of individuals. Akombi *et al.*^[2] examined malnutrition in sub-Saharan Africa and found that the entire region was battling one of the highest levels of child malnutrition globally. Furthermore, countries within East and West Africa were also reported to have the highest prevalence of child malnutrition compared to the WHO Millennium Development Goals target for 2015. In Kenya, the National Bureau of Statistics and ICF International^[3] reported that 26% of children were stunted, 11% of children were underweight, while 5.5% were wasted. Inadequate nutrition is of concern as children living with disabilities are reported to be at an even higher risk of malnutrition than children without disabilities.^[4] Shaar *et al.*^[5] demonstrated this, by carrying out a population-based survey of 185 children with visual and hearing impairment in Lebanon. On comparing the children with disability to 370 other children who had no disabilities, the study revealed that children with visual and hearing impairment had a nutritional disadvantage relative to their peers and the US NCHS reference population. Deaf children in the U.S.A have also demonstrated a higher prevalence of being overweight than national averages.^[6]

Several reasons have been linked to the higher prevalence of malnutrition among disabled children. Imbalanced diets and sugary foods have been substantial contributing factors to inadequate nutrition of children with neurodevelopmental disabilities.^[4] Low income and unemployment have also been identified as playing a pivotal role in increasing malnutrition.^[7] Emmett and Francis^[8] carried out a national cross-sectional survey of individuals with hearing loss in the U.S.A. The study reported that hearing loss was associated with low educational attainment, low income, and unemployment or underemployment. Similarly, an exploratory quantitative study in Ghana found that the majority of people with disabilities live in poverty and suffer unemployment.^[9]

In Kenya, some people with a hearing disability are confectionery (sweet) vendors in cities across the country. Deaf adults and children gather at these points to purchase confectioneries and to socialise. Though there were no studies found that had explored this, there is a possibility that these confectionery vending points could be worsening the nutritional status of deaf children.

MATERIALS AND METHODS

The study was cross-sectional, carried out in Nairobi, Kenya's capital. It comprised of two groups; one group consisted of children with Hearing Disability (HD) aged 5-15-years attending city council primary schools in Nairobi County. The comparison group constituted children without HD also aged 5-15 years attending the same schools. It was designed to have a total of 162 children from Nairobi County. Out of the 162 individuals, 81 (50%) constituted all the children with HD as an isolated handicapping condition, while 81 (50%) were children without HD. Hearing Disability was determined by audiometry measurement according to WHO criteria 2009.^[10] The children with a disability were matched for age and gender with 81 children without any disability from the same schools.

Hearing Assessment

Hearing assessment was carried out by a qualified audiometrist, and each child sat in a quiet room with a sound ambience of 40 decibels or less, measured using a sound level meter. Instructions were then communicated to each child on how to respond. The instructions were given in writing, spoken direction and sign language. Instructions to children with HD were written as well as signed. The hearing loss for each child was measured using a Portable digital EMiD screening audiometer AS208. Hearing loss was measured in each ear at four different frequencies which were as follows: 500Hz, 1000Hz, 2000Hz and 4000Hz. An average hearing loss for each ear was then calculated. The value of hearing loss for the ear with better hearing was recorded as the individual's value. It was noted that all types of hearing disability (conductive, sensorineural and mixed) were included in this study.

Nutritional Assessment

Two weight measurements for each child were taken using a Salter scale with a precision of 0.1 kg. Two height measurements were also considered for each child using a standard height board, placed on level ground, with an accuracy of 0.5cm. The average Body Mass Index (BMI) for age was then derived and used to calculate the BMI indices that were normal, underweight, overweight and obese.

Data validation

The Salter weight scale, the EMiD screening audiometer machine, the sound level meter machine, and the standard height board were calibrated. Calibration of both the principal investigator (Cohen's Kappa score of 0.82) and the audiometrist (Cohen's Kappa score of 0.96) was also carried out.

Data Analysis

This was done using SPSS–12.0 (SPSS Inc, Chicago, Illinois, USA). Nutritional data were analysed using Epi- Info version 3.5.1. Mann Whitney Test, Chi-square Test and Fisher exact test were used in this study.

RESULTS

Socio-demographic characteristics

One hundred and sixty-two children were included in the study. The children were matched for the site, age and gender. There were thirty-six (44.4%) males and 45 (55.6%) females, from those with HD as well as from those without hearing disability. In both groups, the mean age was 10.30 ± 2.89 years. The mean age for the males was 10.22 ± 3.20 years and for the females was 10.36 ± 2.62 years. An insignificant difference was observed between the mean ages of males and females with a Mann Whitney U where $U = 3182$; $p = 0.84$; and also, a Fishers Exact test between the number of males and females was not significant (χ^2 Fisher's Exact Test = 0; DF = 1, $p = 0.56$).

Levels of hearing among all children

Out of the one hundred and sixty-two children 58 (35.80%) had a profound hearing disability, 21 (12.96%) had severe hearing disability and 2 (1.24%) had moderate hearing disability. These children were defined as disabled. Of the remaining children, 74 (45.7%) did not have any hearing impairment, while 7 (4.32%) had a slight hearing impairment. These latter two groups were collectively termed as non-disabled. These results are shown in Figure 1.

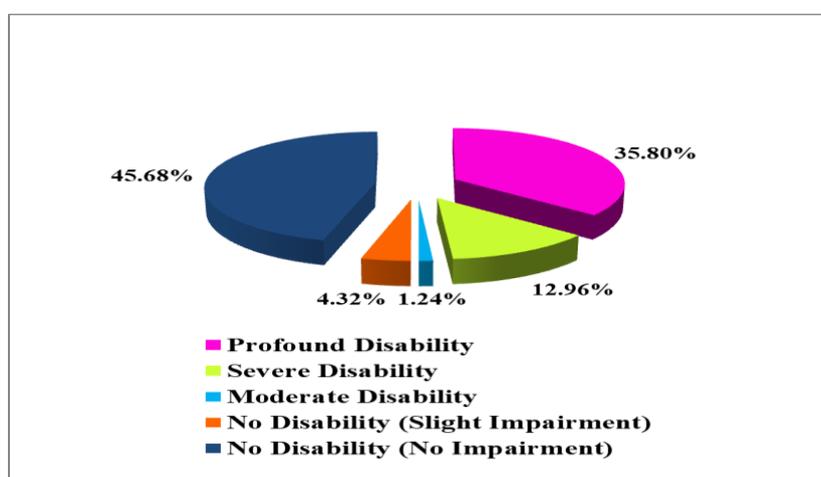


Figure. 1: Levels of hearing impairment among disabled and non-disabled children, n=162.

Disabled children

Eighty-one children had HD. Of these, 58 (71.61%) children had a profound hearing impairment (hearing loss of 81 dB or higher), 21 (25.93%) children had a severe hearing impairment (hearing loss of 61-80dB), and only two (2.46%) children had a moderate hearing impairment (hearing loss of 31 – 60 dB), as shown in Figure 2.

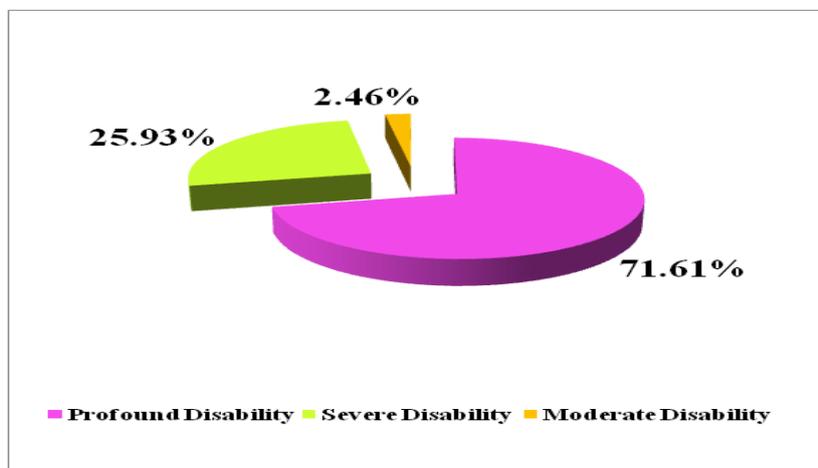


Figure. 2: Levels of hearing impairment among disabled children, n=81.

Thirty-six males had HD. Of these, 28 (77.78%) had a profound hearing impairment, 7 (19.44%) had a severe hearing impairment, and 1 (2.78%) had a moderate hearing impairment. Forty-five females had HD of which, 30 (66.67%) had a profound hearing impairment, 14 (31.11%) had a severe hearing impairment, and 1 (2.22%) had a moderate hearing impairment. There were no significant differences in the gender distribution of children with HD ($\chi^2 = 1.42$, $DF = 2$; $p = 0.49$). Also, no significant difference in the age groups distribution was observed between the children by the level of hearing impairment ($\chi^2 = 3.77$, $DF = 6$; $p = 0.71$).

Non-disabled children

Among the 81 children without HD, 7 (8.64%) had a slight hearing impairment (hearing loss of 26 – 30 dB), and seventy-four (91.36%) had no hearing impairment (hearing loss of 25dB or less). This is illustrated in Figure 3.

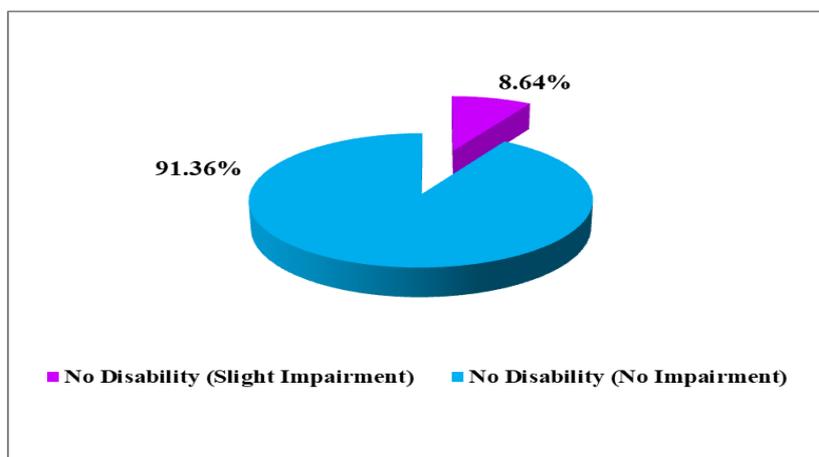


Figure. 3: Levels of hearing impairment among non-disabled children, n=81.

Four males (11.11%) had a slight hearing impairment, and 32 males (88.89%) had no hearing impairment; while 3 (6.67%) females had a slight hearing impairment, and 42 females (93.33%) had no hearing impairment. Insignificant differences were observed by gender distribution (Fisher exact test = 0.50, df =1, p=0.38). Also, there was no statistically significant difference in the age group distribution of these children by the level of hearing impairment ($\chi^2 = 1.16$, df = 3; p = 0.76).

Body Mass Index (BMI) for age: Out of the 162 individuals, 119 (73.5%), had a healthy body mass index while 29 (17.9%) were underweight, 9 (5.5%) were overweight, and 5 (3.1%) were obese. A total of 25 (30.86%) children with a hearing disability had abnormal BMI for age indices, while 18 (22.22%) children without hearing disability had abnormal BMI for age indices, as shown in Figure 4.

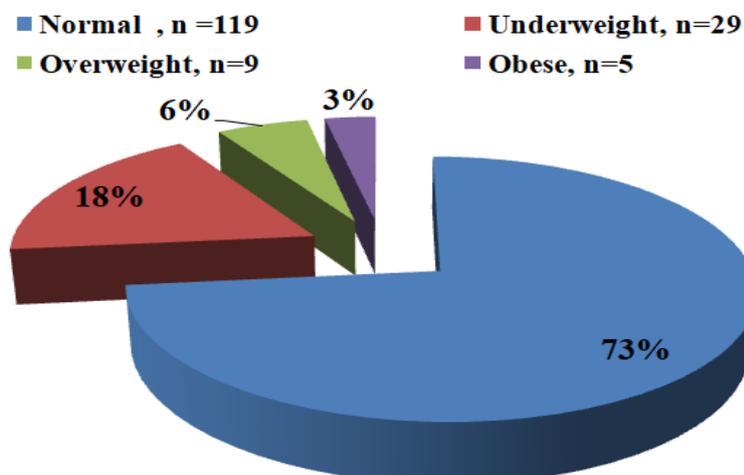


Figure. 4: The body mass index for age for children, n=162.

Children with a hearing disability whose BMI for age was found to be healthy, underweight, overweight and obese were 56 (69.14%), 18 (22.22%), 6 (7.41%) and 1 (1.23%) respectively. Children without hearing disability who were healthy, underweight, overweight and obese were 63 (77.78%), 11 (13.58%), 3 (3.70%) and 4 (4.94%) respectively. Children with a hearing disability had the likelihood of being underweight by 1.82 times ($p=0.15$) and were two times more likely to be overweight ($p=0.30$) compared to the other children. The distribution curve of BMI for age is shown in Figure 5.

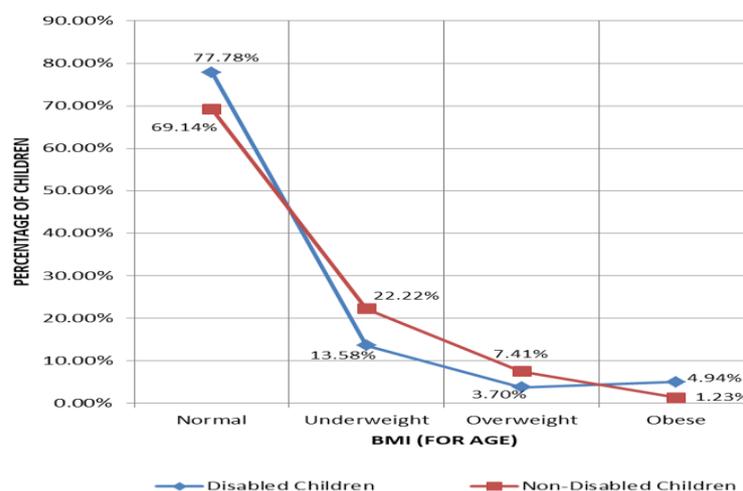


Figure. 5: BMI for age distribution curve of disabled and non-disabled children.

DISCUSSION

Information on the BMI for the age of deaf children in Kenya is scarce. In this study, a high percentage of children with a hearing disability had abnormal BMI for age indices. The observations made in the current survey are consistent with reports from other studies which concluded that people with hearing impairment were more likely to experience health disparities, including malnutrition, compared to the general population.^{[11][12]} In this study, the prevalence of underweight children with a hearing disability (22.22%) was higher than the prevalence of underweight children without disability (13.58%). Though this was not statistically significant, the prevalence of underweight children with hearing disability in this study is relatively higher than that of other studies. NCD Risk Factor Collaboration^[13] reported that 8.4% of girls are underweight globally and 12.4% of boys are underweight globally. Their prevalence of underweight children was lower than the prevalence of underweight disabled children in this study (22.2%). Similarly, a comparison study in Jordan by Al-Rahamneh *et al.*^[14] found that 13.7% of hearing-impaired children aged 6-18 years old were underweight, while 13.0% of a similar group of non-disabled children was underweight.

Their results too were lower than those of underweight children in this study.

On the other hand, overweight and obese Jordanian children in the same study were slightly higher than in this study. They found that 15.2% of hearing-impaired children were overweight, more than that found in this study (7.4%). In the same study, 2.9% of hearing-impaired children were obese, slightly higher than in this study (1.23%). The marked difference between this current study and what was observed in Jordan is not surprising as Jordan is a more developed country in comparison to Kenya. Bleich *et al.*^[15] elaborate on this in their classical exploratory study where more developed countries show evidence of being more overweight/ obese than less developed countries. Still, children with hearing disability in this study were slightly more overweight than the comparison group without a disability. Sugary food intake by hearing disabled children is a likely reason.^[4] In cities across Kenya, people with hearing disability have been observed to commune around hearing-disabled sweet/confectionery sellers. It is possible that after school, deaf children indulge in sugary foods at these vending points. The high prevalence of underweight disabled children in this study may be due to family dynamics. Pupils with hearing impairment come from disproportionately low-income family backgrounds and use medical services less frequently, as demonstrated by Boss *et al.*^[16] Also, social inequalities and relative poverty of families with hearing disabled children can lead to stress and social exclusion, which has been found to worsen the nutritional status of disabled children.^[17]

Children identified with slight hearing impairment (slight hearing loss of 26 – 30 dB) were 8.64% and were completely unaware of their impairment. Though they were not classified as hearing disabled, their guardians were contacted and informed of their state.

CONCLUSION

BMI for age was generally lower among children with hearing disability compared to those without hearing disability. Though the differences were insignificant, it was noted that the disabled children were still found to be nutritionally disadvantaged, eliciting higher prevalences of malnutrition compared to that of global trends.

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CONFLICT OF INTEREST

We have no conflict of interest.

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