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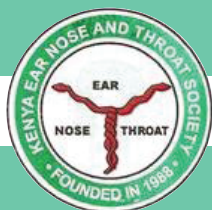
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Highlights from the current issue

Welcome to our January 2020 publication, this is our 4th edition. We have interesting papers covering various aspects of ENT, otolaryngology. Our first article by Okerosi *et al*¹ compares the growth of children post adenoidectomy and/or tonsillitis, comparing them with normal children as a control group. The findings show that surgical treatment improves the growth to statistically similar levels of otherwise normal children. It's a good sample size.

Another study is by Gacani *et al*² on knowledge of clinicians in the management of acute otitis media in our setting. This has a public health implication in our country because the most common cause of hearing impairment among children of the school of the deaf, is chronic suppurative otitis media, which could be or is a result of poorly managed acute otitis media. Therefore, the findings in this study can help planning. They used CDC guidelines on criteria on management of acute otitis media which is similar to WHO. Moreover, this study was done on medical staff which include clinical officers, interns, paediatricians and ENT surgeons at the casualties, the accident and emergency department of the hospitals that were included, and involved 151 health workers. The findings show very few of the clinicians knew the correct criteria for diagnosing acute otitis media as outlined by CDC guidelines. It also showed that clinicians qualifications were associated with correct dosage of medical treatments. This should be of great concern to us because it means there are gaps that the primary caregiver lacks in management of this common condition.

Allergies are very common in our environment. Very few studies have been done on allergies in this region. Therefore this study by Thinguri *et al*³ is a welcome addition to our knowledge. The study is on sensitization to aeroallergens in adults with allergic rhinitis using skin prick test. It was found that indoor allergens were more common than outdoor allergens and the most common allergy was the house dust mite followed by moulds. It would be interesting to find out the outdoor allergens and their seasonal occurrence, although this will have to be done by further studies. It

would also be interesting to find out the pattern of food allergies in our societies.

The article on stress and burnout among clinical residence of the University of Nairobi, (Post-graduate training programs) by Bonko *et al*⁴ shows high prevalence amongst our students and therefore there is a need to help them with coping pressures and mechanisms i.e help the students to balance between work, school and personal lives and also financial problems.

Enjoy the other articles we have including the case reports.

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A COMPARISON OF GROWTH OF CHILDREN WITH OBSTRUCTIVE SLEEP DISORDERED BREATHING POST ADENOIDECTOMY AND/OR TONSILLECTOMY AND THOSE ATTENDING A WELL-BABY CLINIC AT KENYATTA NATIONAL HOSPITAL

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ABSTRACT

Background: Adenotonsillar hypertrophy is the commonest cause of obstructive Sleep Disordered Breathing (oSDB) and adenoidectomy and or tonsillectomy (As+/-Ts) leads to an improvement of symptoms. Studies have been done to assess growth in the affected children post As+/-Ts with varying results. The constitution of the control group also varied.

Objective: To compare the growth of children with oSDB post As+/-Ts with that of a control group consisting of children attending the well-baby clinic.

Methods: One hundred and forty-six children (73 cases, 73 controls) aged between 2 years and 5 years were included in the study. The cases were children recruited from the Kenyatta National Hospital ENT clinic who had oSDB scores above 0.33 on the Sleep Related Breathing Questionnaire Pediatric Subscale (SRDB-PSQ). Controls were recruited from the well-baby clinic and had oSDB scores lower than 0.33 on the SRDB-PSQ questionnaire. Height (HAZ), weight (WAZ) and BMI Z scores were calculated from the weight and height measurements taken preoperatively or at first contact for the study group and controls respectively. Repeat measurements were taken after 3 months.

Results: Data from 62 cases (40 males and 22 females) and 63 controls (34 males and 29 females) was analyzed. Children with oSDB had statistically lower weight height and BMI Z scores when compared to controls (WAZ-0.76 vs 0.14p value<0.001, HAZ -0.54 vs-0.08 p value 0.04, BMI z score -0.67 vs 0.25, p value 0.001). Three months after surgery, there was no statistical difference in the Z scores of the study group and the controls. Both groups had an increase in their Z scores however the increase in the study group was significantly higher.

Conclusion: As+/-Ts improves the growth of children with oSDB to statistically similar levels of otherwise healthy children attending a well-baby clinic as early as 3 months post-operatively.

Key words: Adenoidectomy, Tonsillectomy, Obstructive sleep disordered breathing

INTRODUCTION

Obstructive Sleep-Disordered Breathing (oSDB) is a clinical diagnosis characterized by obstructive abnormalities of the respiratory pattern or the adequacy of oxygenation/ventilation during sleep, which include snoring, mouth breathing, and pauses in breathing. oSDB encompasses a spectrum of obstructive disorders that increases in severity from primary snoring to Obstructive Sleep Apnoea (OSA)¹. The prevalence of oSDB varies between 4-13%^{2,3}. The prevalence of OSA, the severest form of oSDB is between 1.2-5.7%¹⁻³. The commonest cause of oSDB in the paediatric age group is adenotonsillar hypertrophy^{4,5} and adenotonsillectomy has been shown to lead to cure in 79-90% in children without comorbidities⁶⁻⁸.

Obstructive sleep disordered breathing has been thought to lead to substantial morbidities in the cardiovascular, nervous and metabolic

systems. Children with oSDB have higher levels of hypertension, pulmonary artery hypertension and neurocognitive disturbances^{9,10}. oSDB has also been shown to negatively affect growth^{11,12}. Studies done to assess the growth of these children have either had no control group or have had a control group of children with oSDB who were managed medically^{13,14}. The studies with a control group that was considered otherwise healthy have had varied results^{15,16}.

This study sought to compare the growth of children with oSDB who underwent As+/-Ts, to otherwise healthy children on follow up at the well-baby clinic.

MATERIALS AND METHODS

The study was a prospective case controlled study done at the Kenyatta National Hospital. Ethical approval from the Kenyatta National Hospital / University of Nairobi Ethics and Research Committee was sought

and granted. The study period was from April 2018 to December 2018. The study population constituted children aged between 2 to 5 years. Seventy-three children scheduled for As+/-Ts for oSDB from the ENT clinic were recruited into the study as the study group. Seventy-three children attending the well-baby clinic were also recruited as controls. Exclusion criteria for the study group was As+/-Ts for any other indication other than oSDB, comorbid children or previous adenoid surgery. Exclusion criteria for the controls included children with comorbid conditions and those on nutritional supplements.

The study group and controls recruited were subjected to the Sleep Related Breathing Disordered Questionnaire Pediatric Sleep Questionnaire (SRDB-PSQ) developed by Chervin *et al*¹⁷. Cases (study group) were children who met the criteria for severe oSDB i.e. a SRDB-PSQ score of 0.33 and above. All the cases recruited had a score of 0.33 and above, the control group children were also subjected to the questionnaire. Those with SRDB-PSQ scores below 0.33 proceeded with the study. There was only one child with a score above 0.33 who exited the study and was referred to the ENT clinic. The child was replaced by recruitment of another child in the well-baby clinic. The children who proceeded with the study had their weights and heights taken using a SECA weighing scale and a height stadiometer that were stationed at the well-baby clinic. The children in the study group had their heights and weights measured within 24 hours of admission and those in the control group had their heights and weights measured on first contact. Three months later the children in both groups were weighed and had their heights taken again. Their growth parameters were

then converted to Z scores i.e. Weight for age Z score (WAZ), Height for age Z score (HAZ) and BMI for age Z score using the WHO anthro V3.2.2 software. Data analysis was conducted using IBM SPSS (version 21). The student T- test was used to assess the difference in WAZ, HAZ, and BMI Z score between the study group and the control group.

RESULTS

The total number of children recruited at the beginning of the study was 146, 73 in the case group (study group) and 73 in the control group. At 3 months, 11 children in the case group and 10 children in the control group had dropped out of the study. There were 62 children in the case group, 40 males and 22 females, and 63 children in the control group, 34 males and 29 females (Figure 1). The children who dropped out of the study were not included in the data analysis.

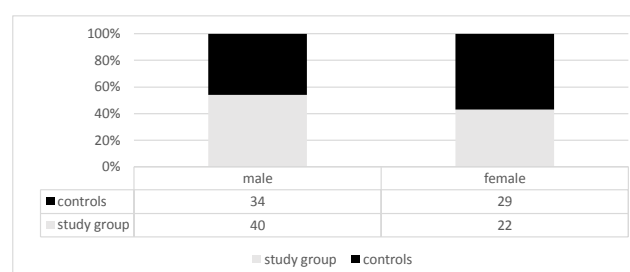


Figure 1: Distribution of male to females for the study group and controls

At the beginning of the study the weight height and BMI Z score for the cases were statistically lower than that of the controls (Table 1). Three months post operatively there was no statistical difference in the WAZ, HAZ, BMI Z Score (Table 2).

Table 1: Anthropometric values of study group and controls at the beginning of the study

| | Study group Mean (SD) | Controls Mean (SD) | Difference (95% CI) | P- value* |
|--------------------------|--------------------------|-----------------------|------------------------|-----------|
| Preoperative weight (kg) | 13.74(2.43) | 14.92(3.49) | 1.18(0.12-2.23) | 0.031 |
| Preoperative WAZ score | -0.76(1.06) | 0.16(1.32) | 0.92(0.50-1.34) | <0.001 |
| Preoperative height (cm) | 96.24(7.64) | 94.46(14.51) | -1.78(-5.84-2.27) | 0.391 |
| Preoperative HAZ score | -0.54(1.17) | -0.08(1.27) | 0.46(0.03-0.89) | 0.04 |
| Preoperative BMI | 14.77(1.62) | 15.94(2.50) | 1.17(0.44-1.91) | 0.002 |
| Preoperative BMI Z score | -0.67(1.29) | 0.25(1.50) | 0.92(0.43-1.41) | <0.001 |

*Two sample t-test

Table 2: Anthropometric values of the study group and controls at 3 months

| | Study group | Controls | Difference (95% CI) | P-value* |
|------------------------------|-------------|-------------|------------------------|----------|
| | Mean (SD) | Mean (SD) | | |
| Postoperative weight (kg) | 15.30(2.50) | 15.49(3.48) | 0.19(-0.87-1.25) | 0.723 |
| Postoperative WAZ score | 0.12(1.03) | 0.48(1.25) | 0.36(-0.04-0.76) | 0.08 |
| Postoperative height (cm) | 98.71(7.47) | 97.21(9.54) | -1.51(-4.52-1.51) | 0.33 |
| Postoperative HAZ score | 0.11(1.18) | 0.20(1.28) | 0.09(-0.35-0.52) | 0.688 |
| Postoperative BMI | 16.46(1.71) | 16.41(2.23) | -0.04(-0.74-0.66) | 0.909 |
| Postoperative BMI Z score 0+ | 0.65(1.15) | 0.56(1.38) | -0.08(-0.53-0.36) | 0.714 |

*Two sample t-test

When the change in Z scores between the two groups was assessed for significance, the increase in WAZ, HAZ and BMI Z scores were statistically higher in the study group (Table 3).

Table 3: Assessment of change in weight, height and BMI Z scores between the cases and controls

| | Study group | | | Control | | | Difference (95%CI) | P-value* |
|------------------------|-------------|----------|--------|----------|----------|--------|-----------------------|----------|
| | Mean | | | Mean | | | | |
| | 0 months | 3 months | Change | 0 months | 3 months | Change | | |
| Weight for age Z score | -0.76 | 0.12 | 0.88 | 0.14 | 0.46 | 0.32 | 0.56(0.42 - 0.67) | p <0.001 |
| Height for age Z score | -0.54 | 0.11 | 0.65 | -0.08 | 0.20 | 0.28 | 0.37(0.24 - 0.52) | p <0.001 |
| BMI for age Z score | -0.67 | 0.65 | 1.32 | 0.25 | 0.55 | 0.30 | 1.02(0.77 - 1.21) | p <0.001 |
| BMI | 14.71 | 16.37 | 1.66 | 15.90 | 16.39 | 0.49 | 1.17(0.70 - 1.63) | <0.001 |

* T-test comparing mean change in controls to mean change in cases

On linear regression analysis, As+/Ts positively correlated to change in WAZ, HAZ and BMI Z score when adjusted for age and sex.

DISCUSSION

This study was a prospective case controlled study with a control arm constituting children attending well-baby clinic. This enabled comparison of growth of the affected children with unaffected children. At the beginning of the study, children with oSDB were found to have significantly lower weight height and BMI Z scores when compared to controls. This could be attributed to the fact that children with oSDB have been found to have lower growth hormone levels¹⁸ and increased work of breathing⁹ than children without oSDB. Three months later both the study group and controls had an increase in the Z scores hence the need

to assess which group had a greater increase and if it was statistically significant. The study group had a greater increase in the Z scores and the change was statistically significant when compared to the controls. When the Z scores of the study group and controls were compared at three months, there was no statistical difference in the Z scores. This has been termed as the children in the study group having 'catch up' growth. This has been thought to be due to increased growth hormone production once the oSDB symptoms have been corrected¹⁸. There is also a reduction in the work of breathing⁹.

Multiple studies done assessing the effect of As+/-Ts on growth of children have had varying results. The follow up period, whether or not there was a control group and the constitution of the control group also varied. This influences comparability of the studies. This study followed the children for 3 months and

found statistically significant increase in weight height and BMI Z scores in the study group when compared to the control group made up of otherwise healthy children. Selimoglu *et al*¹¹ found significant weight and height increase 6 months post adenotonsillectomy (weight Z score from -0.47 to -0.19 p value <0.005, height Z score from -0.27 to 0.20 p value <0.005). The study however only measured the control group at the beginning of the study. Nachalon *et al*¹² in Israel also found significant increase in weight and BMI Z scores 4 to 6 months after surgery (weight Z score from -1.29 to -0.19 p value <0.001, and BMI Z score from -0.45 to 0.36 p value 0.007), the height Z score increased but it was not statistically significant, (from -1.18 to -0.49 p value 0.223). The study however did not have a control group. Katz *et al*¹³ compared early adenotonsillectomy vs watchful waiting. There was a significantly faster increase in weight and BMI Z scores 7 months later in the adenotonsillectomy group when compared to the watchful waiting group. The height increase was however not statistically significant. Al Abdulla *et al*¹⁵ in Bahrain however did not find a difference in BMI percentile scores between the study group and controls. The study assessed growth in children undergoing tonsillectomy but did not limit the inclusion criteria to those with only oSDB. The control group in the study also constituted children with other conditions other than oSDB or chronic recurrent tonsillitis attending their ENT clinic.

CONCLUSION

Clinicians should be aware, among others, of the negative effects of oSDB on growth of the affected children. As+/-Ts improves the growth of children with oSDB to statistically similar levels of otherwise healthy children as early as 3 months post-operatively.

Conflict of interest: This study was self-funded. There was no sponsorship or conflict of interest to declare

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PATTERN OF OTOLARYNGOLOGY FOREIGN BODIES AMONGST CHILDREN AGED LESS THAN 14 YEARS ADMITTED AT A PAEDIATRIC HOSPITAL IN NAIROBI

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ABSTRACT

Background: Foreign body impaction is a problem in children all over the world. It imposes a heavy burden on patients and clinicians. There is little data concerning this problem in this region.

Objectives: This study aimed to review the pattern and epidemiological characteristics of paediatric patients admitted due to foreign body insertion or ingestion at a paediatric hospital.

Design: This was a retrospective cohort hospital-based study.

Methods: Data from hospital records on children aged 0-13 years who presented to the paediatric hospital between 2003 and 2007 due to ENT foreign bodies were included and data from hospital records using structured questionnaires. Variables like age, sex, mode of transport, anatomic location and management methods were retrieved.

Results: A total of 97 cases met the inclusion criteria and were included in the study. General distribution was almost equal. Greater than three quarters (76.3%) of the patients were aged 0-5 years. The commonest anatomical region affected was the ear (35.1%) followed by the nostril (27.8%). All were unintentional injuries and in 86% of the cases anaesthesia was required to manage the problem. Thirty two (94.1%) cases of the foreign body ingestions or insertions took place in the home.

Conclusion: Cases of children presenting to hospital with foreign bodies in the ear, nose and throat are not uncommon and may require removal under anaesthesia. Efforts should be made to prevent these.

Key words: Ingestion, Insertion, Foreign bodies, Childhood, Paediatric, Nairobi

INTRODUCTION

The insertion of Foreign Bodies (FBs) into the body cavities is common in the paediatric age group due to their adventurous and explorative nature and easy accessibility of certain orifices such as the ear, nostril and mouth¹. FBs are responsible for 11% of all ENT emergencies and complications result in 22% of these cases¹⁻³, with children making up to 80% of the cases.

Children are a cause of major concern because the symptoms may be vague, and the children may be too young to express themselves clearly. They sometimes go unnoticed for a period before the source of discomfort in the child is identified⁴. The effects may be mild or severe depending on anatomical location and nature of the FB. The complications include but are not limited to the following: tinnitus, otitis media, tympanic membrane perforation, oesophageal rupture, and broncho-aspiration³. Chemical components in FBs can cause severe burns or poisoning. The most dreaded outcome is the foreign body getting lodged in the air or food passages⁵ and can lead to death⁶.

The most common foreign bodies are coins, batteries, beads, food, plastic toys, and household items⁴. Others include paper, cotton wool, rubber, stones and crayons⁷. Due to the easy accessibility of FBs in children it is necessary to ensure their adequate supervision during play and feeding. Strict manufacturing regulation of toys, in terms of size of toys and removable parts including components or materials used is imperative to increase child safety. The shape, size and anatomic location determine the method of removal of the FBs. Even the cooperation of the child is important, and it may determine the manner of removal. Hence a small FB near the tympanic membrane or a large FB lodged in the trachea-bronchial tree will necessitate the need for removal in theatre.

MATERIALS AND METHODS

This was a retrospective hospital-based study conducted at Gertrude's Gardens Children's Hospital, a paediatric hospital in Nairobi, Kenya. The hospital is a busy non-profit making organization run by a trust. It is located about 7 kilometers from the central business

district. Data was collected following ethical approval by the Institutional Ethical Board.

Data from hospital records on children aged 0-13 years who presented to the paediatric hospital between 2003-2007 due to foreign body insertion or ingestion were included and data extracted from hospital records using structured questionnaires. The variables included age, sex, circumstances of insertion or ingestion and mode of transport to the hospital. Eventual diagnosis and management were also recorded. Frequency distributions and measures of dispersion and central tendency were analyzed using SPSS version 20 computer software and displayed in the form of tables and graphs.

RESULTS

According to Table 1, in the period between 2003 and 2007 there were a total of 27,160 admissions at this hospital. Of these, 1,058 (3.8%) were admitted because of injuries. Of the injury admissions 97 (9.2%) were FB related. The ratio of males to females was almost equal (males 52%; females 48%). Greater than three quarters (76.3%) of the patients were under 5 years of age.

Table 1: Demographic information of foreign bodies

| | Frequency | Percentage |
|----------------|-----------|------------|
| Admissions | 27160 | 100 |
| Injuries | 1058 | 3.8 |
| Foreign bodies | 97 | 0.3 |
| Males | 50 | 52 |
| Females | 47 | 48 |
| Under 5 years | 74 | 76.3 |
| Over 5 years | 23 | 23.7 |

In the under 5-year category, the highest frequency of foreign bodies was noted in 36-47 months and the lowest in the less than 12 months category (Figure 1).

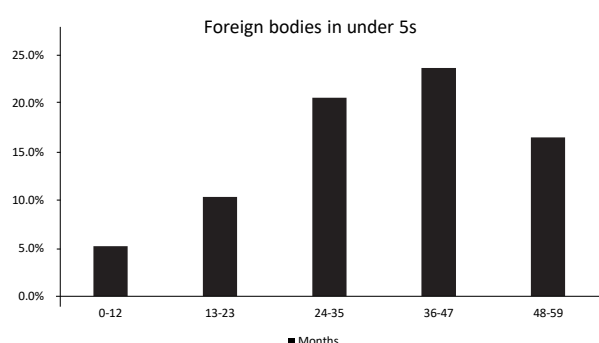


Figure 1: Age distribution in under 5-year category

Table 2 demonstrates the frequency of foreign body location was in the ear (34; 35.1%), nasal fossae (27; 27.8%), digestive tract (26; 26.8%), trachea-bronchial tree (6; 6.2%), and oropharynx (3; 3.1%). The lowest frequency was in the lungs and stomach at 1% each.

Table 2: Anatomic location of foreign body

| | Frequency | Percentage |
|------------|-----------|------------|
| Ear | 34 | 35.1 |
| Nostril | 27 | 27.8 |
| Oesophagus | 26 | 26.8 |
| Bronchus | 6 | 6.1 |
| Oropharynx | 3 | 3.1 |
| Lung | 1 | 1.0 |
| Stomach | 1 | 1.0 |

Table 3: Pattern of foreign body

| | Frequency | Percentage |
|--------------------------|-----------|------------|
| Intentional | 0 | 0 |
| Unintentional | 97 | 100 |
| Occurrence at home | 91 | 94.1 |
| Other location | 6 | 5.9 |
| Presence of eye witness | 7/77 | 9.1 |
| Absence of eye witness | 70/77 | 90.1 |
| Transport by private car | 41/53 | 77.3 |
| Public transport | 8/53 | 15.1 |
| Transport by taxi | 4/53 | 7.6 |
| Removed in theatre | 84 | 86.6 |
| Not removed in theatre | 13 | 13.4 |

Table 3 shows the pattern of foreign body. Majority of foreign bodies occurred in the house (91; 94.1%) and all of them were non-intentional. Eyewitnesses were recorded in 77 (79.4%) of the cases. An eyewitness was present in only 7 (9.1%) cases. Of these, the most common was a parent in 4 (57.1%) cases and the house help in 2 (28.6%) of cases. Data on mode of transport was available in 53 cases of which 41 (69.5%) of the patients were transported to the hospital by private car; 4 cases by taxi and the remaining 8 by a other modes of public transport. Eighty-four patients (86.6%) went to theatre for removal of the foreign body under general anaesthesia.

DISCUSSION

This study provided some insight into the epidemiology of foreign body insertions and ingestions in children admitted to Gertrude's Gardens Children's Hospital. This area is the preserve of specialist otolaryngologists. For most injury types, males predominate probably

because they naturally tend to be more adventurous and aggressive than females. In this study, the male to female ratio was almost equal (1.08:1) correlating with studies done in other parts of the world such as Nigeria, Singapore and South America⁶⁻⁹ as well as in Kenya^{10,11}.

Most children injured were under 5 years of age (76.3%) particularly the sub-group aged 2-4 years. Children's natural explorative nature and high activity increases as the child becomes more mobile but thereafter decreases with age. A pattern was seen in Nigeria and elsewhere¹²⁻¹⁴ whilst some other studies showed predominance in a slightly older age group (4 years and above), especially for FB in the ear^{6,8,9,15}.

The main sites of FB insertion or ingestion were the ear (35.1%), the nostril (27.8%) and the oesophagus (25.8%). This correlates with other studies that have nasal and aural FBs seen more common in children⁸. This is probably since the ear, nose and mouth are easily accessible orifices.

Circumstances of injury were all unintentional. Accidental FB ingestion in children is the norm, differing from that in adults, who are usually involved with intentional ingestion¹.

In this study, most injuries occurred at home (94.1%). This is not surprising considering the main age group affected which was under-fives who spend most of their time at home. Despite that, an eyewitness was only present in seven of the cases; even the best parent or caregiver in the world cannot watch their children all the time.

Kenya doesn't have an organized national emergency care system which explains the finding in this series that the main mode of transport to the hospital was by private cars (69.5%) with none by ambulance. It is instructive to note that bronchial (6%) foreign bodies can occlude the airways and prove fatal if a quick response is not undertaken.

Majority of the foreign bodies were removed in theatre (86.6%). This is dissimilar to other reports which quote up to 4.4%¹⁶. Several factors may contribute to the differences in relation to the literature seen in the need for general anaesthesia. These include visibility and depth of FB, multiple attempts at removal serve to decrease cooperation on the part of the child, increasing the risk of complications¹⁷ and making the need for anaesthesia more likely¹⁴ pointing to the gravity of the problem.

LIMITATIONS

This was a hospital based retrospective study with the attendant shortcomings of this methodology including inaccurate record keeping, missing records, incomplete information and selection bias (this was a single institution) used.

CONCLUSIONS

Foreign bodies are a common occurrence in the practice of otorhinolaryngology. In this series, most foreign bodies are found in patients' ears, followed by the nostrils and then the oesophagus.

Children less than 5 years are the most affected age group. Majority of foreign bodies were removed in theatre. Further research in the area specifically on types of FB, modes of presentation, time elapsed from injury and the resulting injuries or mortality.

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KNOWLEDGE, ATTITUDES AND PRACTICES IN MANAGEMENT OF ACUTE OTITIS MEDIA AMONG HEALTH CARE PROVIDERS AT THREE PUBLIC HOSPITALS IN NAIROBI, KENYA: A CROSS SECTIONAL STUDY

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ABSTRACT

Background: Acute Otitis Media (AOM) is among the commonest indications for antimicrobial use. However, due to poor knowledge and attitudes of clinicians towards set guidelines, there is growing concern over inappropriate antimicrobial use with resultant resistance.

Objective: The aim of the study was to determine the knowledge, attitudes and practices of clinicians in management of AOM in three public hospitals in Nairobi, Kenya.

Design: This was a cross-sectional hospital based Knowledge, Attitude and Practice (KAP) study.

Methods: One hundred and fifty-one clinicians were recruited by purposive sampling. The study was conducted in the form of a pre-tested questionnaire.

Results: Only two ENT consultants knew the correct criteria of diagnosing AOM as outlined by CDC. Twenty-eight (18.5%) clinicians were familiar with the watch and wait practice while 78.8% would immediately prescribe antibiotics for AOM. Thirty-five percent and 33.1% of the clinicians knew the first line and second line antimicrobial agents respectively in treating AOM with 17.9% and 24.5% knowing the correct dose of first line and second antimicrobial agents respectively. Consultant ENT surgeons had the best knowledge, attitude and practice concerning AOM management.

Conclusions: Only three of the study participants knew the CDC criteria on management of AOM. Majority of the clinicians used non-specific signs and symptoms that were not sufficient to diagnose AOM before commencing antimicrobial treatment with little role for watchful waiting. Most of the clinicians expressed concerns over complications of AOM as the reason behind immediate use of antimicrobials.

Key words: Knowledge, Attitude, Practices, Acute otitis media, Public hospitals

INTRODUCTION

Acute Otitis Media (AOM) is an inflammatory process of the middle ear cleft defined by a rapid onset and lasting less than 3 weeks¹. These infections are a frequent cause of absenteeism from school among school going children². Ear infections, such as AOM, are of great concern especially in the developing world, as they may cause retarded language development and progress in school among children³. Over-diagnosis and over-treatment with broad based antimicrobials are often thought to occur in management of this condition. Otoscopy classically shows a thickened hyperemic tympanic membrane which is immobile on pneumatic otoscopy. The CDC recommends that AOM should not be diagnosed without visualization of middle ear fluid confirmed by pneumatic otoscopy or tympanometry⁴.

Treatment of AOM entails stepwise treatment modalities for different severity scales of the infection. Children aged two years or more as well as adults without co-morbidities and with non-severe illness (mild otalgia and fever less than 39°C) can benefit from watchful waiting with use of analgesics/antipyretics

but no antibiotics because AOM symptoms improve in most cases within 1–3 days. This is, however, not recommended for children less than 2 years old if AOM is certain (moderate or severe otalgia or temperature greater than 39°C)⁴.

High-dose amoxicillin (70–90 mg/kg/day in children) or 500mg three times daily for adults is recommended as first-line treatment for seven to ten days. High dose amoxicillin-clavulanic acid (70-90mg/kg/day in children or 1 gram twice daily in adults) is recommended as second line treatment for seven days⁵. High dose cefuroxime (30mg/kg/day in children or 500mg twice daily in adults) for seven days may be used as an alternative to amoxicillin-clavulanic acid as second line treatment.

MATERIALS AND METHODS

This was a prospective cross-sectional study carried out at Kenyatta National Hospital, Mbagathi District Hospital and Mama Lucy Kibaki Hospital. All three are public facilities within Nairobi, Kenya. The study population comprised of interns, physicians, paediatricians, clinical officers and ENT surgeons,

except those who were working in the ENT department at the Kenyatta National Hospital. Informed consent was obtained from the clinicians who qualified to participate in the study. Ethical approval was obtained from the Kenyatta National Hospital Ethics Committee.

RESULTS

Majority of the study participants were post graduate students whereas the consultants accounted for the least.

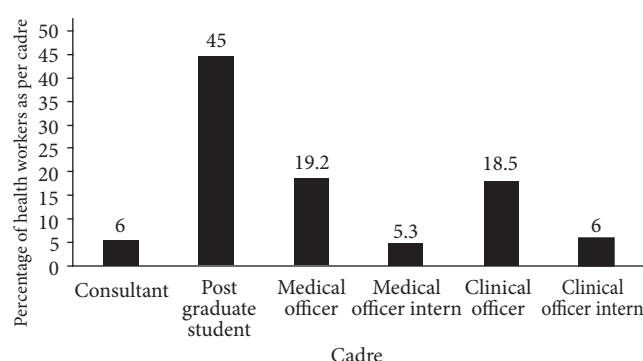


Figure 1: Study participants as per cadre

Nearly half of the study participants (51%) had less than 7 years of clinical experience. Fever, otalgia and erythematous tympanic membrane were the most commonly used symptoms for diagnosing acute otitis media.

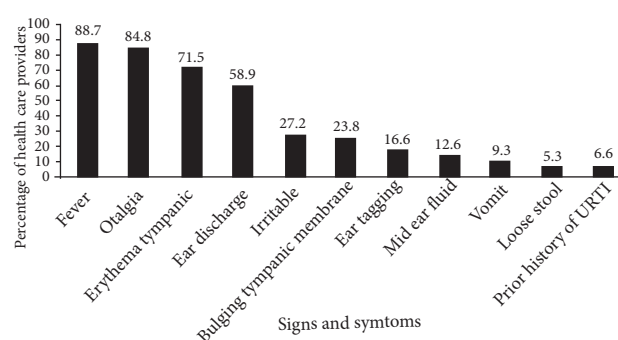


Figure 2: Signs and symptoms used by health care providers in diagnosing AOM

From a total of 151 health workers, 78.8% would immediately prescribe antibiotics for patients presenting with features of AOM. Only twenty eight (18.5%) health workers would adopt for watchful waiting prior to starting antimicrobials.

Approximately one-third of clinicians used amoxicillin as first line and amoxicilin-clavulanic acid as second line treatment for both adults and paediatric patients. Three (2.0%) health workers reported that they were aware of the CDC criteria in AOM management, who included two consultants and a medical officer. Only the two ENT consultants correctly knew the CDC criteria for diagnosing and managing AOM (Table 1).

Table 1: Correct antibiotic dosing per department

| | | | Post graduate paediatrics | Post graduate internal medicine | Consultant ENT | Consultant paediatrics | Consultant internal medicine | Total |
|----------------------------|------------|---------|------------------------------|---------------------------------------|-------------------|---------------------------|------------------------------------|-----------|
| Amoxicillin | Adult | Yes | 2(1.3) | 8(5.3) | 2(1.3) | 0(0.0) | 2(1.3) | 14 (9.3) |
| | | No | 31(20.5) | 27(17.9) | 0(0.0) | 2(1.3) | 3(2.0) | 63 (41.7) |
| | | P-value | 0.005 | | | | | |
| | Paediatric | Yes | 8(5.3) | 0(0.0) | 2(1.3) | 0(0.0) | 0(0.0) | 10 (6.6) |
| | | No | 25(16.6) | 35(23.2) | 0(0.0) | 2(1.3) | 5(3.3) | 67 (44.4) |
| | | P-value | < 0.001 | | | | | |
| Amoxicillin Clavulanate | | | | | | | 22 (14.6) | |
| | Adult | Yes | 7(4.6) | 13(8.6) | 2(1.3) | 0(0.0) | 0(0.0) | 55 (36.4) |
| | | No | 26(17.2) | 22(14.6) | 0(0.0) | 2(1.3) | 5(3.3) | |
| | | P-value | 0.068 | | | | | |
| | Paediatric | Yes | 8(5.3) | 0(0.0) | 2(1.3) | 0(0.0) | 0(0.0) | 10 (6.6) |
| | | No | 25(16.6) | 35(23.2) | 0(0.0) | 2(1.3) | 5(3.3) | 67 (44.4) |
| | | P-value | <0.001 | | | | | |
| Cefuroxime | Adult | Yes | 7(4.6) | 12(7.9) | 2(1.3) | 1(0.7) | 4(2.6) | 26 (17.2) |
| | | No | 26(17.2) | 23(15.2) | 0(0.0) | 1(0.7) | 1(0.7) | 51 (33.8) |
| | | P-value | 0.024 | | | | | |
| | Paediatric | Yes | 6(4.0) | 1(0.7) | 2(1.3) | 1(0.7) | 0(0.0) | 10 (6.6) |
| | | No | 27(17.9) | 34(22.5) | 0(0.0) | 1(0.7) | 5(3.3) | 67 (44.4) |
| | | P-value | <0.001 | | | | | |

Sixty-six percent of the clinicians considered coverage of target micro-organisms as the reason behind choice of treatment, while 13.2% and 25.2% considered appropriate use of antimicrobials and prevention of resistance respectively.

DISCUSSION

The CDC is a United States federal agency that protects public health through disease control and prevention both in the US and internationally. Being an integral part of WHO, guidelines set by CDC are used globally. Institutions may have their own guidelines with regard to different diseases but these are often similar to CDC guidelines in many ways. CDC guidelines are considered the gold standard in most situations. The challenge with adopting such for the developing world countries is in relation to availability of required facilities to comply. The local Kenyan guidelines do not give concise adult or paediatric doses of antimicrobials as well as varied choices of antimicrobials in treating AOM hence heavily relying on CDC or American Academy of Paediatrics

In this study, only three (2%) health workers reported that they were aware of the CDC criteria on AOM management. This is in contrast to Garbutt *et al*⁶ in United States of America, who found that 90% of the study participants were aware of the CDC criteria and had read it. The study subjects in this case were paediatricians and were therefore more likely to have read the guidelines since AOM patients are often managed by paediatricians. This Kenyan study had 53 paediatricians out of whom none was aware of CDC guidelines on AOM. This might explain the reliance of study participants on wrong symptoms and signs to diagnose AOM. CDC recommends that a diagnosis of AOM should not be made without verification of middle ear fluid by either pneumatic otoscopy or tympanometry. Although the availability of pneumatic otoscope or tympanometry was not sought in the study, the situation on the ground is that the pneumatic otoscope is not available in the clinic settings of the three public hospitals. Tympanometry is available at KNH but at a fee hence restricting its accessibility. This does not, however, explain the lack of knowledge regarding their significance in the diagnosis of AOM.

CDC specifies situations when antibiotics may not be prescribed for AOM. This is not always adhered to for different reasons. A significant proportion (78.8%)

of the clinicians in this study immediately prescribed antibiotics for all their patients with AOM. Guillermo⁷ reported pressure from parents, concerns over litigation and parent or patient satisfaction as reasons for non-adherence to this recommendation. In this study, the main reason for immediate antibiotic prescription was avoidance of complications.

The CDC recommends the use of amoxicillin at 90mg/kg/day for 7 to 10 days. A very low percentage of health workers in the study prescribed correct doses of amoxicillin in adult patients (17.9%) and paediatric patients (9.9%). This is in sharp contrast to a study by NoaShviro *et al*⁸ in a study on health care providers in Southern Israel where 75% amoxycillin was the first line drug of choice among the study subjects but only 17.9% and 9.9% knew the correct dose for adults and children respectively. This is in sharp contrast to a study by NoaShviro *et al*⁸ in a study on health care providers in Southern Israel where 75% of study participants prescribed the correct dose of amoxicillin in AOM treatment.

Varying reasons why spectrum of antimicrobial agent was important were given. Majority (66.2%) considered coverage of target organisms important while 25.2% considered prevention of resistance as the reason why spectrum antimicrobials is important. In the study by Guillermo⁷, antibiotic spectrum was generally not considered as important as choosing a drug known to successfully treat AOM.

The study also shows that clinician qualification was significantly associated with correct paediatric amoxicillin dosing ($p < 0.001$), correct paediatric amoxicillin clavulanate dosing ($p < 0.001$) as well as correct paediatric cefuroxime dosing ($p < 0.001$).

CONCLUSION

Based on the above results, it is notable that only a marginal number of health workers in the three public hospitals know or apply the CDC guidelines on management of AOM.

RECOMMENDATION

The country needs to put in place appropriate guidelines that can be used to manage AOM while at the same time ensuring that the gold standard recommendations are taught in the clinical areas.

Conflict of interest: The authors declare that there was no conflict of interest.

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SENSITIZATION TO AEROALLERGENS IN ADULT PATIENTS WITH ALLERGIC RHINITIS AT KENYATTA NATIONAL HOSPITAL

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ABSTRACT

Background: Allergic rhinitis represents a global health problem. Sensitization is a risk factor for developing allergic rhinitis. There is a dearth of data on sensitization to aeroallergens in the developing countries particularly those in sub-Saharan Africa.

Objective: To determine the prevalence and pattern of sensitization to aeroallergens in patients with allergic rhinitis at Kenyatta National Hospital (KNH) Ear, Nose and Throat (ENT) outpatient clinic.

Design: A cross sectional study.

Methods: Adult patients on follow up for allergic rhinitis at the KNH ENT outpatient clinic were enrolled in the study in a consecutive manner. Allergy testing via skin prick testing was carried out as described in the Allergic Rhinitis Impact on Asthma (ARIA) guidelines. The indoor aeroallergens that were evaluated included house dust mite, mould, cockroach and cat dander for allergens. Grass pollen was tested for outdoor aeroallergens.

Results: Eighty one patients diagnosed with allergic rhinitis were enrolled in the study. Majority of the patients (96%) tested had sensitization to at least one of the tested allergens. House dust mite was the most prevalent allergen (77%) followed by moulds (57%) and cockroaches (43%). The prevalence of sensitization to cat dander and Bermuda grass was 40% and 30% respectively. Monosensitization was found in 12.3% of the patients.

Conclusion: Indoor allergens were more common than outdoor allergens. Skin prick testing should be encouraged in patients with allergic rhinitis due to the high prevalence of sensitization.

Key words: Allergic rhinitis, Asthma, Aeroallergens, Sensitization, Allergens, Skin prick test

INTRODUCTION

Allergic rhinitis is the most prevalent type of rhinitis. It is a heterogeneous disorder that significantly impairs the patient's quality of life, and its prevalence has markedly increased in recent decades^{1,2}. Worldwide, the burden of allergic diseases has been increasing steadily particularly in the low and middle income nations. Moreover, the key manifestations of respiratory allergy, namely, allergic rhinitis and asthma, have been on the rise in the last two decades³. Globally, it is estimated that there are 400 million patients with allergic rhinitis and 334 million patients with asthma^{3,4}. Asthma ranks among the top most specific diseases, with respect to years lost to disability adjusted life years⁵. It is associated with allergic rhinitis in 74% to 81% of the cases⁶.

Allergic sensitization is defined as the production of immunoglobulin E (IgE) in response to allergens¹. This represents a principal step in the pathogenesis of IgE-mediated allergic diseases. As a result, it is a key risk factor in development of allergic rhinitis and asthma^{3,7,8}.

There is paucity of published literature on sensitization to aeroallergens in patients with allergic rhinitis especially in sub-Saharan African countries such as Kenya. The lack of evidence is an impediment to the design and implementation of preventive measures. The present study was conducted to address this gap, at least partially, by investigating the prevalence of sensitization to selected aeroallergens among adult patients with allergic rhinitis seeking treatment at the Kenyatta National Hospital (KNH) Ear, Nose and Throat (ENT) outpatient clinic.

MATERIALS AND METHODS

This was a hospital-based cross sectional study done between March and September 2018. The study population comprised of adult patients (≥ 18 years) who were on follow up for allergic rhinitis at the KNH ENT out-patient clinic. Ethical approval to conduct the study was obtained from KNH and University of Nairobi Ethics Review Committee. Written informed consent was sought from all the study participants. In this study, clinical diagnosis of allergic rhinitis was done as per the Allergic Rhinitis Impact on Asthma (ARIA) 2010 guidelines which defines allergic rhinitis as watery rhinorrhoea with one or more of the following symptoms; nasal blockage, sneezing and nasal itching⁹. Exclusion criteria included patients who were pregnant, those who had diffuse dermatological conditions, those on drugs that interfere with the skin prick test, those with response persistent severe or unstable asthma and non-consenting patients. Data was collected using an interviewer-administered questionnaire. Skin prick tests were performed by the principal investigator as described by the European Academy of Allergy and Clinical Immunology¹⁰. Five standardized allergen extracts acquired from Diagenics Limited (Milton Keynes, United Kingdom):

(i) *Mould*: Allergen extract for mould was a mould mix which contains; *Aspergillus fumigatus*, *Mucor mucedo*, *Penicillium notatum*, *Pullularia pullulans*, *Rhizopus nigricans* and *Serpula lacrymans*.

(ii) *Cockroach*: The common cockroach in our setup is the German cockroach, allergen tested was *Bla g 2*. House dust mite: *D. pteronyssinus*.

(iii) *Grass pollen*: Commonest grass species in our setup is the Bermuda grass and the one we tested, *Cyn d 1* being the commonest allergen.

(iv) *Cat dander*: Allergen that was used is *Fel d 1*, has been shown to be the commonest allergen.

The positive control was 9% histamine hydrochloride and the negative control was normal saline 0.9% solution. The volar aspect of the forearm was cleaned with alcohol and then a drop of each of the test solutions was applied on the skin. A skin-prick test was done within the drop using a lancet. The results of the tests were read after 15 minutes. The mean wheal diameter was measured using a ruler and recorded in millimetres (mm). A positive test was taken to be any wheal diameter that was 3 mm or greater than the

negative control. A patient who exhibited a positive reaction to at least one of the five aeroallergens was considered to have an allergen sensitization.

Data entry and statistical analyses was conducted using IBM SPSS v. 20. Descriptive analysis involved calculating mean and standard deviations (SD) for normally distributed continuous variables. Continuous data with skewed distributions were described using medians and interquartile ranges. Categorical data were described using absolute numbers and proportions. A cut off value of $p < 0.05$ was set as the threshold for statistical significance during hypothesis testing.

RESULTS

A total of 81 patients aged 18 years and above presenting to KNH with allergic rhinitis were recruited in the study. The mean age of the patients was 36.7 years (SD 8.9) with an age range from 18 to 57 years. The most common age group was 30-39 years accounting for 33 (40.7%) of the patients. There were 49 (60.5%) female patients and 32 (39.5%) male patients, giving a male-to-female ratio of 2:3. Out of the 81 allergic rhinitis patients in the study 41 (50.6%) were persistent, moderate-severe cases (Table 1). There were 33 (40.7%) cases with comorbid conditions, namely asthma 27 (33.3%) and eczema 10 (12.3%). Four (4.9%) cases had both comorbidities (Table 2).

Table 1: Severity of allergic rhinitis diagnosis in adults in KNH

| | Frequency (n=81) | (%) |
|---|---------------------|------|
| Severity of allergic rhinitis diagnosis | | |
| Intermittent, mild allergic rhinitis | 20 | 24.7 |
| Persistent, mild allergic rhinitis | 1 | 1.2 |
| Intermittent, moderate-severe allergic rhinitis | 19 | 23.5 |
| Persistent, moderate-severe allergic rhinitis | 41 | 50.6 |

There were 75 (92.6%) patients who were positive for at least one of the five aeroallergens. The rest (6; 7.4%) showed no sensitization to the test aeroallergens. Monosensitization occurred in 10 (12.3%) of the patients with allergic rhinitis. The specific aeroallergens to which these 10 patients were sensitive to were: house dust mite ($n = 5$), moulds ($n = 2$), cockroach ($n = 1$) and cat dander ($n = 2$). Polysensitization occurred in 65 (80.3%) (Figure 1).

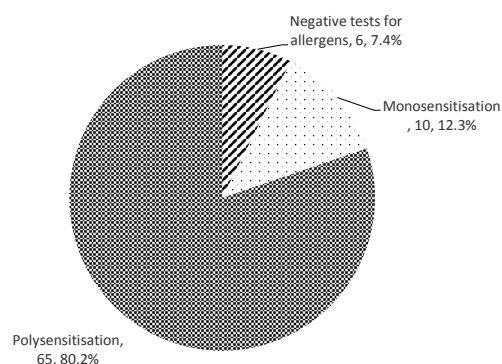


Figure 1: Sensitization for aeroallergens in adult patients with allergic rhinitis

Table 2 shows the distribution of the patients by the number of aeroallergens they had sensitization to. Patients who were sensitive to two, three, four

aeroallergens were 24 (29.6%), 27(33.3%) and 10 (12.4%) respectively. Four patients were sensitive to all the five allergens.

Table 2: Sensitization according to number of aeroallergens

| No. of aeroallergens | No. positive (n=81) | (%) |
|----------------------|---------------------|------|
| 0 | 6 | 7.4 |
| 1 | 10 | 12.4 |
| 2 | 24 | 29.6 |
| 3 | 27 | 33.3 |
| 4 | 10 | 12.4 |
| 5 | 4 | 4.9 |

Disease severity did not have an impact on sensitization pattern. For all the four disease severity most patients had polysensitization (Table 3).

Table 3: Association between number of positive allergens per patient and disease severity

| | Negative | Mono-sensitization | Poly-sensitization | P-value |
|---|----------|--------------------|--------------------|---------|
| Rhinitis severity | | | | |
| Intermittent, mild allergic rhinitis | 0(0.0) | 2(10.0) | 18(90.0) | 0.301 |
| Persistent, mild allergic rhinitis | 0(0.0) | 0(0.0) | 1(100.0) | 0.883 |
| Intermittent, moderate-severe allergic rhinitis | 3(15.8) | 3(15.8) | 13(68.4) | 0.220 |
| Persistent, moderate-severe allergic rhinitis | 3(7.3) | 5(12.2) | 33(80.5) | 0.998 |

The pattern of sensitization did not differ for disease comorbidities, for both comorbidities most patients with and without the condition had polysensitization (Table 4).

Table 4: Association between number of positive allergens per patient and comorbidities

| Condition | Negative | Mono-sensitization | Poly-sensitization | P-value |
|---------------|----------|--------------------|--------------------|---------|
| Asthma | | | | |
| Yes | 2(7.4) | 3(11.1) | 22(81.5) | 0.972 |
| No | 4(7.4) | 7(13.0) | 43(79.6) | 0.972 |
| Eczema | | | | |
| Yes | 1(10.0) | 1(10.0) | 8(80.0) | 0.926 |
| No | 5(7.0) | 9(12.7) | 57(80.3) | 0.926 |

Pattern of sensitization to aeroallergens in patients with allergic rhinitis are presented in Figure 2.

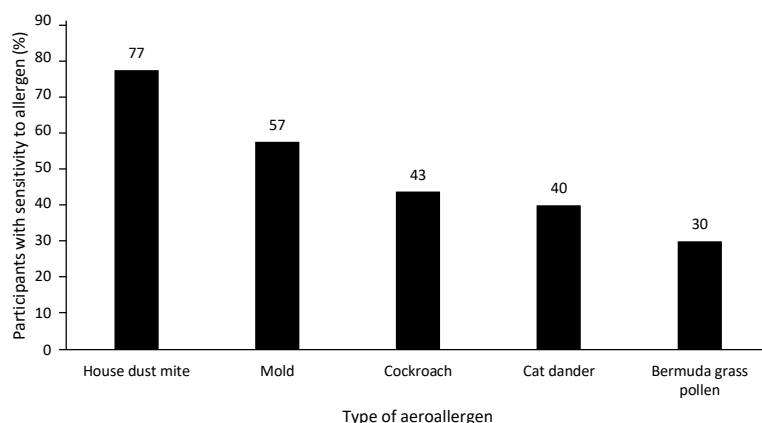


Figure 2: Pattern of sensitization to aeroallergens in allergic rhinitis according to types of aeroallergens

There was no evidence of a statistically significant association between positive test findings for sensitivity to house dust mites, mould, cat dander or Bermuda grass pollen and patient factors including age and sex. However there was a significant association between positive results in sensitivity test for cockroach aeroallergen and patient gender, $p = 0.009$. The odds of sensitivity to cockroach aeroallergen in females was 73% higher than that in males with positivity of 55.1% versus 25% in females and males respectively.

There was no statistically significant association between the two conditions (asthma and eczema) and house dust mite, mould, cockroach or cat dander sensitivity. Bermuda grass pollen sensitivity however showed a statistically significant association, $p = 0.034$. Sensitivity to pollen among patients with eczema was 60% compared to 25.4% among those without eczema.

DISCUSSION

Sensitization to aeroallergens in patients with allergic rhinitis plays a major role in the pathogenesis of disease. Sensitization to at least one aeroallergen was found to be at 92.6%. The prevalence was higher than what was found by Lee *et al*¹¹ at 70.1%, because the study included a wider age group of allergic rhinitis patients with an age range of 3 to 70 years with noted prevalence of sensitization decreasing with age. Prevalence of sensitization was also noted to be lower in non-hospital based studies like that of Ngahane *et al*¹² in Cameroon who conducted the study in college students and found sensitization to be at 42.8%.

The commonest allergen was found to be house dust mites at 77%. Several studies done in various parts of the world have shown house dust mites to be the commonest allergen in allergic rhinitis patients. Farrokhi *et al*¹³ in Iran found the prevalence of sensitization to house dust mites to be 88.5%. A study done in Cameroon by Ngahane *et al*¹² found house dust mites to be the commonest aeroallergen participants were sensitized to. Mould was the second commonest allergen with a prevalence rate of 53%, followed by cockroach at 43% prevalence in this study. Some studies done showed that cockroach sensitization was the second commonest allergen. Lâm *et al*¹⁴ in North Vietnam and Ngahane *et al*¹² in Cameroon all found that cockroach sensitization was the second commonest indoor allergen, mould sensitization was low. The Vietnam study was a population based study and the sensitization to cockroach was the same for both rural and urban areas while the Cameroon study was done in an urban setting.

Severity of disease or presence of comorbidities, asthma and eczema, had no significant association with prevalence of sensitization. We did however find it affected the pattern of sensitization, with a higher prevalence of sensitization to Bermuda grass in patients with eczema 60% and 25.4% in patients with eczema. There was no statistically significant association between age and the pattern and prevalence of sensitization in this study. Ngahane *et al*¹² also found that the pattern of sensitization was the same for different ages, though he had a younger population of college students. Christoff *et al*¹⁵ analyzed a wider range in age (3 years to over 44 years) in their participants and found no association with sensitization. Sex was also not a significant factor in prevalence of sensitization. In this study however we found a cockroach allergy was more common in women than men, with positivity being 55.1% in women and 25% in men. The difference between the cockroach sensitization in females could be due to the gender roles in our communities. Women tend to be the ones who do more of the chores at home, including more time spent in the kitchen where the cockroaches are found in the homes. This would lead to higher exposure in the women than the men hence the higher sensitization in the women than men.

Monosensitization was at 12.3% with house dust mite being the most common allergen, which is comparable to the study by Ngahane *et al*¹² in Cameroon who found monosensitization at 13.2% but for them cockroach was the commonest allergen. No monosensitization to Bermuda grass was found. Polysensitization has been found to be more common in patients with allergy, this study had a rate of 80.3% with 33.3% having sensitization to two allergens and 4.9% to all five allergens tested.

In conclusion, the current study showed a high prevalence of sensitization to aeroallergens in patients with allergic rhinitis with house dust mite being the commonest allergen. Polysensitization was more prevalent than monosensitization. We recommend skin prick tests be incorporated as part of the management of allergic rhinitis patients at the clinic as allergen avoidance is important in management of the disease.

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DANGEROUS DECIBELS: RECREATIONAL NOISE EXPOSURE AMONG MEDICAL STUDENTS IN NAIROBI, KENYA

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ABSTRACT

Background: Recreational noise is on the rise and young adults are increasingly exposing themselves to dangerous sound levels from recreational activities. Noise induced hearing loss is permanent. Excessive noise exposure can lead to hearing-related problems such as Noise-Induced Threshold Shifts (NITS), tinnitus, noise sensitivity and eventually Noise-Induced Hearing Loss (NIHL). Hearing is not damaged typically by day to day sounds. However, the possibility for noise induced hearing loss is increased if one engages in loud activities for prolonged periods of time.

Objective: To determine the amount of recreational noise exposure among young adults in medical school using the recreational noise questionnaire.

Design: This was a cross sectional study.

Methods: The study was performed in the ENT Department of KNH among young adults in medical school aged 18-35 years. Subjects were recruited via convenient sampling after which they completed a recreational hearing habits questionnaire. Data analysis was conducted using SPSS version 18. During the initial descriptive analysis each variable in the database was analysed, in turn. For continuous data including age, mean and standard deviation was calculated. Frequency distribution was used to summarize the categorical variables

Results: One hundred and sixty three subjects were recruited and evaluated with a mean age of 24.6 years and a M:F sex ratio of 1.04:1. The average total sum of spent hours per week for all activities was 5.6 hours (range, 1.8-12.1 hours) with a median of 5.1 hours. The average total sum of spent hours per year was 293.2 hours (range, 93.6 – 629.2 hours) with a median of 265 hours. The highest weekly noise exposure in equivalent SPLs was found in going to night clubs (82.9 dBA). The median weekly equivalent noise exposure for all activities was 67.7 dBA. Fifteen point three percent of subjects exceeded the Environmental Protection Agency limit of 75 dBA.

Conclusion: A large number (15.3%) of youth expose themselves to harmful noise above the recommended exposure level of 75dBA. The median weekly noise exposure levels are high but not over the limit.

Key words: Recreational noise, Noise-induced hearing loss, Youth hearing impairment, Concerts, Nightclubs, Music festivals and personal listening devices

INTRODUCTION

The rise of non-occupational hearing loss is of concern¹ and has been documented to have tripled in the last 20 years². Excessive noise exposure can lead to hearing-related problems such as Noise-Induced Threshold Shifts (NITS), tinnitus, noise sensitivity and eventually Noise-Induced Hearing Loss (NIHL). Hearing is not damaged typically by day to day sounds. However, the possibility for noise induced hearing loss is increased if one engages in loud activities for prolonged periods of time^{3,4}.

Whereas, there are no studies on the effects of recreational noise exposure in Kenya, investigators from other parts of the world have not only reported

the prevalence of recreational noise exposure in some countries but also shown a trend towards increasing NIHL from this exposure^{3,5-8}.

Public legislation and Recommended Exposure Levels (RELs) have been established by regulators to reduce both occupational and non-occupational noise. Occupational exposure to noise is well documented⁹. The European Union Directive 2003/10/EC¹⁰ set exposure limit values and exposure action values of $L_{EX,8h}$ 80 dB(A) and 85 dB(A) respectively.

Today, the environmental noise standards are primarily two. The US Environmental Protection Agency (EPA) established a limit of $L_{EX, 8hr}$ 75 dBA¹¹. Twenty-five years later, the World Health Organization (WHO) adopted Community Noise Guidelines and recommended exposure limit of $L_{EX, 8hr}$ 75 dBA¹².

It is imperative to note that the Kenyan law, both NEMA¹³ and the Factories Act¹⁴ sets a noise ceiling of between 25 dB(A) and 55 dB(A) for non-occupational noise. Sounds at those levels are not harmful to the ear. These restrictions are not in keeping with either EPA¹¹ or WHO standards⁹ or other scientific literature^{15,16} and require to be realigned.

The ubiquity of music exposure makes hearing health care professionals' worried¹. There is heterogeneity in the global literature of recreational noise because some literature looked at solitary sources of noise exposure whereas others looked at noise in the context of multiple recreational activities. Various sources of sound produce different sound levels.

Going to night clubs regularly can be a cause of high noise exposure according to William's *et al*⁴. The mean noise levels were 97.9 dBA with a range of 90-105dB. The second part of the study found that 60% of the recommended noise exposure levels in an entire lifetime is acquired during the short 10-year period where revelling is a regular activity. This underlined the notion that going to a night club provides a significant source of noise for young people.

Henderson *et al*¹ reported a 75% increase in popularity of personal listening devices between 1990 and 2005. Torre¹⁷ reported 90% of youth between 18-30 years used personal listening devices. Swanepoel and colleagues¹⁸ performed sound level measurements in a stadium and described a range between 113dB and 130dB.

Vogel *et al*¹⁹ using questionnaires on self-reported music exposure from variable sources reported that 54.4% of participants exceeded the noise limit. Keppler *et al*²⁰ who also using a questionnaire concerning recreational noise exposures, placed the subjects into 3 self-reported groups of low, intermediate and high noise exposure. The average weekly noise exposure was 70.09 dBA. One third of the subjects were exposed to noise higher than 75dBA.

Jokitulppo *et al*²¹ demonstrated that 50% of Finnish youth had an average weekly noise exposure of 80dBA with 27% of Finnish conscripts being exposed to noise levels over the 85 dBA risk limit.

Young adults are immersed in social activities that may be dangerous to their hearing and wellbeing. The term "ipod oblivion" is used to describe the inattentiveness of those engrossed with PLDs²². This may lead to risk or injury because of lack of awareness and an enabling attitude towards noise and hearing loss. This is clear when a survey showed 45% of adolescents did not know there was a program that could limit the noise output on their PLDs. Despite the awareness, most adolescents indicated they would not utilize such technology²².

These findings therefore support the notion that cumulative exposure to combined sources of non-occupational noise is hazardous.

The objective of the study was to determine the amount of recreational noise exposure among young adults in medical school using the Recreational Noise Questionnaire.

MATERIALS AND METHODS

This was a cross sectional study, conducted at Kenyatta National Hospital Ear Nose and Throat outpatient clinic. The target population were students between the ages of 18-35 years recruited from University of Nairobi, School of Medicine via consecutive sampling. The sample size was 163. Approval was granted by the KNH – UON Ethics and Research Committee, P671/11/2017.

Data collection was done by the principle investigator using a standardized structured questionnaire (recreational habits questionnaire) to document bio data and recreational hearing habits.

The recreational habits questionnaire was based on various studies^{20,21,23,24}, regarding recreational noise exposure. It included questions on exposure to noise, frequency of exposure, subjective loudness of exposure and use of hearing protection devices during exposure. The sources of recreational noise exposure were evaluated in time spent per week or month, the total time of exposure (in years), and subjective estimation of loudness. The scale of loudness referred to the following sound levels:

- (i) A normal conversation, (60 dB)
- (ii) A loud conversation, (70 dB)
- (iii) If one must shout over 1 m, (80 dB)
- (iv) If one must shout over a near distance, (90 dB)
- (iv) Where communication is impossible (100dB)

This self-estimated loudness corresponded to A-weighted equivalent sound pressure levels (SPLs) ranging from 60 dBA to 100 dBA for ratings 1 to 5, respectively.

The weekly equivalent noise exposure per activity was calculated as;

$L_{Aeq,w} = L_{Aeq} + 10 \times \log_{10} (T_w / T_0)$, where;

L_{Aeq} = the A-weighted equivalent SPLs from 60 dBA to 100 dBA,

T_w = the time spent per week in h, and

T_0 = the 40-h reference of a workweek.

Accordingly, the lifetime equivalent noise exposure per activity was computed as

$L_{Aeq,l} = L_{Aeq,w} + 10 \times \log_{10} (T_y)$, where;

T_y = the time of exposure in years.

The weekly and lifetime equivalent noise exposures for all activities ($L_{Aeq,w,all}$ and $L_{Aeq,l,all}$) were determined by calculating the logarithm of the average $L_{Aeq,w}$ and $L_{Aeq,l}$ in Pa, respectively. These calculations were adopted from Jokitulppo.²¹ Subjects were divided into 3 groups. This was based on the quartiles of the $L_{Aeq,w,all}$ and $L_{Aeq,l,all}$. The subjects with low, intermediate and

high recreational noise exposure were represented by the lower quartile, the interquartile range and the upper quartile.

Data analysis was conducted using SPSS version 18. During the initial descriptive analysis each variable in the database was analysed, in turn. For continuous data including age, mean and standard deviation was calculated. Frequency distribution was used to summarize the categorical variables (e.g hearing loss).

A cut off value of 0.05 was used to determine statistical significance.

RESULTS

The study population consisted of 163 subjects ranging from 22-29 years with a mean age of 24.6 years (SD 1.1). There was an almost equal representation with a sex ratio of M:F 1.01:1

Table 1: Recreational noise characteristics

| Activity | Percentage of subjects (%) | Laeq,w (dBA) | Laeq, l (dBA) | Time spent | |
|---|----------------------------|--------------|---------------|------------------|------------------|
| | | | | Per week (hours) | Per year (hours) |
| Watch TV | 84 | 61.7 | 70.8 | 9.0 | 468.0 |
| | 82 | 55.3 | 66.5 | 10.7 | 556.4 |
| Listen to music via headphones | | | | | |
| Go to the movie theatre | 80 | 66.2 | 73.8 | 5.9 | 306.8 |
| Listen to music via speakers | 77 | 68.0 | 74.4 | 12.1 | 629.2 |
| Go to night clubs | 41 | 82.9 | 88.2 | 5.3 | 275.6 |
| Exercise to music | 38 | 62.9 | 65.7 | 4.4 | 228.8 |
| Play videogames | 29 | 61.5 | 67.8 | 7.9 | 410.8 |
| Attend musical concerts | 28 | 71.4 | 76.0 | 2.3 | 145.6 |
| Attend or participate in indoor sports events | 20 | 59.5 | 64.6 | 5.1 | 265.2 |
| Practice a musical instrument | 15 | 63.1 | 68.6 | 3.6 | 187.2 |
| Use of tools | 5 | 63.0 | 68.9 | 1.8 | 93.6 |
| Play with fireworks | 4 | 71.3 | 76.9 | 2.4 | 124.8 |
| Play in a band | 4 | 63.6 | 71.6 | 2.3 | 119.6 |

The results support the fact that a high percentage of young adults in this study engaged in recreational activities. The most commonly engaged activities among the subjects were watching TV (84%), listening to music via headphones (82%) and going to the movie theatre (80%). However, none of the individual activities was above the noise threshold. The activities with the most spent hours per week were 12.1 hours at night clubs, 10.7 hours listening to music via headphones and 9 hours watching TV. The average total sum of spent hours per week for all activities was 5.6 hours (range, 1.8-12.1 hours) with a median of 5.1 hours. The average total sum of spent hours per year was 293.2 hours (range, 93.6 – 629.2 hours) with a median of 265 hours.

The only activity that crossed the threshold of the Laeq,w of 75 dBA was going to night clubs at 82.9 dBA among 41% of responders. Playing with fireworks and attending music concerts were the next activities with high noise exposures of Laeq,w of 71.2 dBA and 71.4 dBA respectively. However, playing with fireworks had a very low engagement levels of 4% and less than a third of subjects attended music concerts. The average for the total weekly noise exposure was 65.41 dBA (range, 55.3-82.9 dBA). The average for the total lifetime noise exposure was 71.83 dBA (range, 63.2-88.2 dBA).

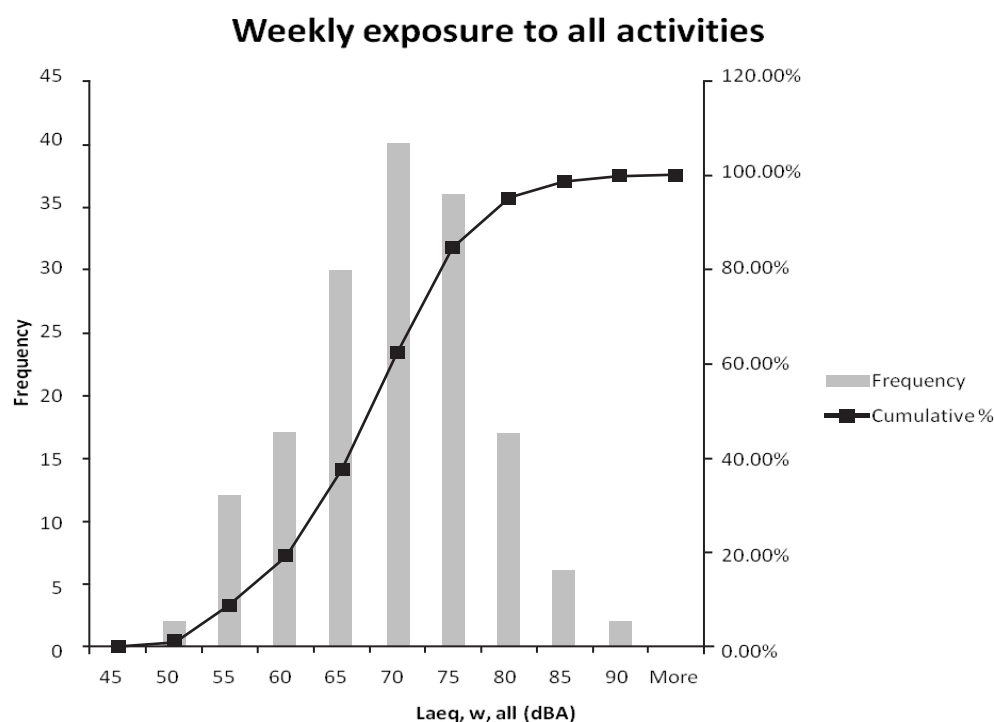


Figure 1: Figure demonstrating weekly exposure to all activities

Altogether, 15.3% of subjects were exposed weekly to noise levels above the 75 dBA risk limit set by the EPA. Only 4.9% of subjects exceeded the minimum action value of 80 dBA set by the European Union Directive 2003/10/EC (2003). Using the least stringent criteria, the maximum allowable limit of the European Union Directive 2003/10/EC (2003), a paltry 1.2 % exceeded the 85 dBA limit.

This highlights the issue that plagues global research of noise exposure; different regulatory agencies in different jurisdictions using different recommended exposure limits.

Table 2: Weekly noise exposure to all activities

| Group | Noise exposure | Distribution | Laeq, w, all (dBA) |
|---------|----------------|-----------------------------|--------------------|
| Group 1 | Low | Lowest quartile (n=41) | 46.7-61.1 |
| Group 2 | Intermediate | Inter-quartile range (n=81) | 61.2-73.1 |
| Group 3 | High | Highest quartile (n=41) | 73.1-89.2 |
| | | Median (standard deviation) | 67.7 (8.3) |
| | | Range | 46.7-89.2 |

For the weekly noise exposure to all activities the lowest 25% ranged between 46.7-61.1dBA, the intermediate 50% between 61.2-73.1dBA and the highest 25% ranged between 73.1-89.2dBA.

The median weekly noise exposure for all activities was 67.7 dB (SD 8.3 dBA) with a range of

46.7- 89.2 dBA. The median noise exposure was below the recommended exposure levels. This demonstrates most young people are not exposed to harmful noise levels. However, there is a small minority at risk.

DISCUSSION

This is the first report of the prevalence of recreational noise in young adults in Kenya. These results suggest that young adults are being exposed to hazardous levels of noise.

A large number (15.3%) of youth expose themselves to harmful noise above the recommended exposure level of 75 dBA. Studies elsewhere showed a prevalence of 11%-50%^{21,20}. In the other studies, participants attended night clubs, pop concerts and indoor sports events almost thrice as much as the subjects in this study. This may be due to the higher variety of leisure activities available in European countries. The prevalence in this study of noise exposure among young adults is crucial because these young adults have not yet been exposed to occupational noise nor have they undergone the steady auditory degeneration of increasing age. Furthermore, the prevalence of recreational noise is on the increase^{1,2}.

Even though the 5 activities most engaged in brought the most concern in the media and modern discourse, none of these recreational activities were above the EPA limit of 75 dBA and as such none are sources of hazardous noise. Despite the worrisome popularity of PLDs, there are other sources of recreational noise which require our attention. This compares similarly with other studies that showed use of PLDs doesn't give the highest noise exposure^{20,25}.

Going to a night club was a common recreational activity among the subjects (41% attendance) with a mean of 5.3 hours per week which agreed with Jokitulppo *et al*²¹ and Williams *et al*⁴. Characteristically, going to a night club produced the highest sound, 82 dBA, which is above the maximum weekly noise exposure permitted. The high noise output in night clubs is in keeping with other studies that looked at noise and going to night clubs^{3,4,23,24}. Regularly going to a night club is an element of youth culture which embraces high noise exposure. A continuous period of regular club attendance with exposure to noise hazards contributes to a significant portion of lifetime exposure to noise. The EUs Scientific Committee on Emerging and Newly Identified Health Risks estimated that 5-10% who listen to music at sound levels exceeding 89 dBA for 1 hour per week are at risk of permanent hearing loss after 5 years or more¹⁶.

CONCLUSION

Young people willingly engage in hazardous noise activities and hence are most vulnerable to recreational and leisure noise-induced hearing loss. According to this study, the prevalence of 15.3% of subjects were exposed weekly to hazardous recreational noise levels. The median weekly noise exposure levels are high but not over the limit.

STUDY LIMITATIONS

This was a cross sectional study and may have led to a recall bias or errors in the calculation of a-weighted weekly and lifetime equivalent noise exposure values. The noise levels vary during the activities, unlike the steady noise in occupational settings.

RECOMMENDATIONS

Noise management is crucial. Night club goers require to be informed and warned about the dangers they are exposing themselves to and the auditory effects of their activities. The development of standards or guidelines to regulate recreational noise exposure should be revised. Hearing loss is cumulative hence a long-term prospective study following a cohort and measuring their occupational and recreational noise exposure would provide the natural history of NIHL secondary to recreational noise exposure. A follow up study to identify the effects of non-occupational noise exposure on young adults is required.

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Conflict of interest: None to be declared.

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STRESS AND BURNOUT AMONG CLINICAL RESIDENTS OF THE UNIVERSITY OF NAIROBI POSTGRADUATE TRAINING PROGRAMS

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ABSTRACT

Background: Stress is an underestimated clinical entity especially among trainee clinicians.

Objective: This study aimed at describing perceived stress and burnout experienced by postgraduate students at the university of Nairobi clinical residency programs in terms of the prevalence, clinical subtypes and sociodemographic determinants. This study will help in raising awareness on stress and burnout and stimulate interventions to improve the quality of work life of residents. This will improve the quality of residency training locally and internationally.

Design: This was a cross-sectional descriptive study.

Methods: The study was carried out among clinical residents of all clinical specialties and at all levels of residency, at the Kenyatta National Hospital (KNH) and Chiromo Campuses of the University of Nairobi (UoN). Data collection tool was a 72-item questionnaire that captured information on demography, characteristics and clinical subtypes of stress and burnout experienced by clinical residents using the 10-item Perceived Stress Scale (PSS-10), Maslach Burnout Inventory (MBI) and the 36-item Burnout Clinical Subtypes Questionnaire (BCSQ-36). Simple correlation was used to establish associations and to test the significance of bivariate or multivariate relationships. Student t-test was used to compare mean responses on standardized scales.

Results: A total of 128 residents completed our questionnaire. The mean age of respondents was 31.98 years \pm 2.98 and ranged from 20 to 40 years. Males constituted a majority 73(57%), of the population. Our participants were mostly in the monthly income range of 500USD to 1000USD, 37(38.9%). Mean PSS score for our population was 21.7 \pm 5.3 and 60.9% of participants reported stress levels in the middle and upper tertiles. Females and residents who preferred not to disclose their gender had significantly higher mean levels of perceived stress than males (22.9 and 24.33 vs 20.82 respectively, $P=0.03$). Burnout was mainly driven by emotional exhaustion, with 65.7% of residents having mean scores in the middle and upper tertiles of emotional exhaustion. Depersonalization was found in 39.9% of the population. Lowest levels of personal accomplishment were found in 57.8% of residents. Compared to those with higher income, residents with income less than 500USD per month had lower scores for personal accomplishment (39.96 \pm 8.56 vs 43.5 \pm 2.12, $P=0.021$). The most prevalent burnout clinical subtype in our population was the frenetic subtype, with mean score of 5.06 \pm 0.86. The under-challenged subtype was more prevalent among residents with supplementary years ($P=0.03$).

Conclusion: Prevalence of stress and burnout was high among our clinical residents and burnout was largely driven by emotional exhaustion. The most prevalent clinical subtype was the frenetic subtype. Management strategies of stress and burnout should be geared towards helping clinical residents find a balance between work, school and their personal lives. Financial support may be beneficial. We recommend larger multicenter studies in our setting which aim at elucidating more determinants of burnout and coping mechanisms employed by clinical residents of the University of Nairobi.

Key words: Stress, Burnout, Clinical residents, Nairobi

INTRODUCTION

Generally, stress is the psychological perception of pressure and the body's response to it. Such pressures which may be construed as either threatening or challenging may emanate from events (stressors) within or without, resulting in psychological and physiological strain within the individual¹. Burnout or professional exhaustion syndrome is a stress-induced problem characterized by a state of mental,

physical or emotional exhaustion, reduced sense of personal accomplishment and depersonalization². Residency training and clinical practice is reputed for being challenging and demanding, placing the resident at the risk of burnout. Burnout has been linked to absenteeism, decreased job satisfaction and medical errors³. Residents have been shown to have higher levels of stress during their training with higher frequencies of depressive symptoms, decreasing humanism, increasing cynicism and impaired family

life than members of academic staff such as consultants and other faculty members⁴. There is a paucity of data on the prevalence of burnout among postgraduate students in medical training programs in Kenya. In this study, we aimed at describing perceived stress and burnout experienced by postgraduate students at the University of Nairobi clinical residency programs in terms of the prevalence, clinical subtypes and socio-demographic determinants. This study will help in raising awareness on stress and burnout and stimulate interventions to improve the quality of work life of residents. This will improve the quality of residency training locally and internationally.

MATERIALS AND METHODS

This was a cross-sectional descriptive study carried out among clinical residents of all clinical specialties including, surgically oriented and non-surgically oriented residency programs at all levels of residency, at the Kenyatta National Hospital (KNH) and Chiromo campuses of the University of Nairobi (UoN). We excluded residents who were at our study sites for external rotations or were not duly registered under UoN training programs. Study participants were selected by convenience sampling within their various disciplines. Ethical approval was obtained (Protocol number: P234/04/2018) from the UoN/KNH ethics and review committee prior to commencement of the study. Data collection tool was a 72-item questionnaire that captured information on demography, satisfaction with training, characteristics and clinical subtypes of stress experienced by surgical residents using three validated measurement tools. The Perceived Stress Scale (PSS) is a 10-item validated self-report tool for assessing the degree to which a person appraises the situations of their life to be stressful and has been linked to a person's quality of life. The scale can be viewed as a two factor construct measuring both "perceived helplessness" and "perceived self-efficacy" and thus apart from measuring the degree of stress, it also measures the amount of coping a person employs with the stressful situations they get exposed to⁵. Widely accepted as a clinical diagnostic tool for assessing clinical burnout is the Maslach Burnout Inventory (MBI)². It is a self-report tool that assesses the effects of stress on individuals under three subscales namely; emotional exhaustion, depersonalization and personal accomplishment. MBI was originally validated among health care workers in the United States by Christina Maslach in 1996 and has become the most commonly used instrument for assessing burnout in an occupational setting. The 36-item burnout clinical subtype questionnaire (BCSQ-36) is another validated self-report tool for assessment and clinical classification of burnout which also incorporates various stress-coping mechanisms employed by individuals to combat occupational stress. Three

clinical subtypes of burnout can be deduced from this scale which are frenetic, under-challenged and the worn-out. It is also vital in designing treatment modalities for occupational stress^{6,7}.

Data management and analysis

Categorical data was presented as frequencies and percentages while continuous data was presented as mean and standard deviation. Simple correlations were used to establish associations and to test the significance of bivariate or multivariate relationships. Student t-test was used to compare mean responses on standardized scales. A P-value of <0.05 was considered as statistically significant. Results from our measurement scales were categorized into three tertiles based on previous studies^{2,8,9}.

RESULTS

Demographic characteristics: A total of 128 completed filled questionnaires were received by the end of our data collection period. The mean age of respondents was 31.98 years \pm 2.98 and ranged from 20 to 40 years. A majority, 82(64.1%) were in the 30-35 years age group (Figure 1).

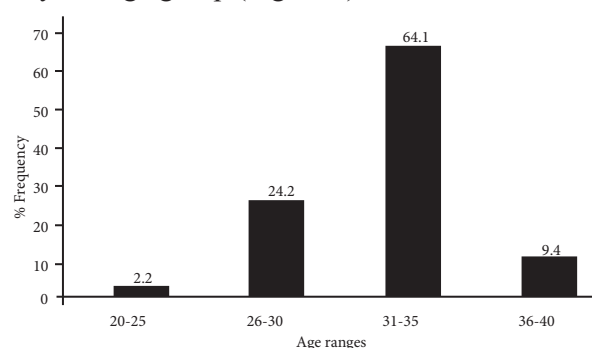


Figure 1: Age distribution of study population

Males constituted a majority 73(57%), of the population. Three residents (2.3%), however, preferred not to disclose their gender. There were more residents in surgically oriented specialties, 71(55.5%) than non-surgical specialties, 57(44.5%). The distribution of residents with respect to their levels of training is as shown in Figure 2.

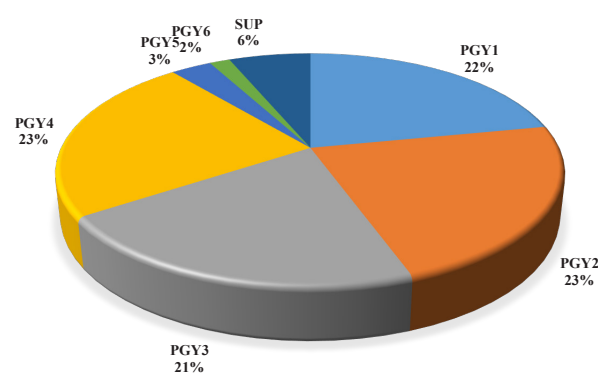


Figure 2: Distribution of participants according to level of training

Our participants were mostly in the monthly income range of 500USD to 1000USD, 37(38.9). Only 2(1.6%) were on a monthly income of more

than 2000USD. The demographic characteristics of respondents in association with the various stress and burnout measures used is shown in Table1.

Table 1: Demographic characteristics of respondents in association with the various stress and burnout measures

| Variable | Frequency (%) | Perceived stress scale | The Maslach burnout inventory | | | Burnout clinical subtypes questionnaire | | |
|----------------------|---------------|------------------------|-------------------------------|-------------------|-------------------------|---|------------------|----------|
| | | | Emotional exhaustion | Depersonalization | Personal accomplishment | Frenetic | Under-challenged | Worn-out |
| Age (years) | | | | | | | | |
| 20-25 | 3(2.3) | 24.67 | 29.67 | 7.00 | 30.00 | 4.61 | 3.03 | 4.25 |
| 26-30 | 31(24.2) | 22.55 | 25.94 | 6.38 | 32.55 | 4.98 | 2.38 | 3.88 |
| 31-35 | 82(64.1) | 21.61 | 23.43 | 6.62 | 32.65 | 5.09 | 2.72 | 4.03 |
| 36-40 | 12(9.4) | 20.08 | 23.42 | 6.92 | 37.83 | 5.18 | 2.64 | 4.17 |
| P-value | | 0.41 | 0.68 | 0.99 | 0.46 | 0.70 | 0.62 | 0.84 |
| Gender | | | | | | | | |
| Male | 73(57) | 20.82 | 25.33 | 7.12 | 32.81 | 5.05 | 2.75 | 4.09 |
| Female | 52(40.7) | 22.94 | 23.15 | 5.67 | 33.29 | 5.08 | 2.49 | 3.96 |
| Prefer not to say | 3(2.3) | | 29.33 | 9.67 | 34.67 | 5.11 | 2.25 | 3.33 |
| P-value | | 0.03 | 0.49 | 0.27 | 0.94 | 0.98 | 0.48 | 0.42 |
| Belief system | | | | | | | | |
| Catholic | 40(31.3) | 21.36 | 23.03 | 6.08 | 34.45 | 5.19 | 2.41 | 3.88 |
| Protestant | 61(47.7) | 22.95 | 25.74 | 7.43 | 30.87 | 5.95 | 2.82 | 4.14 |
| Muslim | 17(13.2) | 20.00 | 23.65 | 4.65 | 36.88 | 5.21 | 2.46 | 3.95 |
| Others | 10(7.8) | 19.1 | 20.20 | 7.00 | 34.20 | 4.99 | 2.67 | 3.86 |
| P-value | | 0.05 | 0.51 | 0.35 | 0.16 | 0.50 | 0.45 | 0.64 |
| Sponsorship | | | | | | | | |
| Government | 75(58.6) | 21.92 | 25.04 | 7.09 | 32.36 | 5.20 | 2.72 | 4.05 |
| Private | 10(7.8) | 20.4 | 23.9 | 7.20 | 31.5 | 4.66 | 2.33 | 4.30 |
| Self | 43(33.6) | 21.81 | 22.74 | 5.60 | 34.6 | 4.93 | 2.33 | 3.47 |
| P-value | | 0.69 | 0.63 | 0.41 | 0.51 | 0.07 | 0.06 | 0.42 |
| Clinical discipline | | | | | | | | |
| Non-surgical | | | | | | | | |
| Surgical | 71(55.5) | 22.12 | 23.99 | 7.45 | 33.51 | 5.01 | 2.90 | 4.00 |
| | 57(44.5) | 21.48 | 24.42 | 5.54 | 32.67 | 5.12 | 2.42 | 4.02 |
| P-value | | 0.49 | 0.85 | 0.07 | 0.67 | 0.48 | 0.04 | 0.94 |
| Marital status | | | | | | | | |
| Single | 71(55.5) | 21.31 | 23.7 | 6.79 | 32.9 | 5.03 | 2.75 | 4.03 |
| Married | 53(41.4) | 22.28 | 24.96 | 6.30 | 33.25 | 5.10 | 2.48 | 3.98 |
| Divorced | 3(2.3) | 22.67 | 22.00 | 7.33 | 37.33 | 5.39 | 2.19 | 3.53 |
| Widow/widower | 1(0.8) | 24.00 | 23.00 | 7.00 | 20.00 | 4.25 | 4.58 | 6.00 |
| P-value | | 0.73 | 0.94 | 0.97 | 0.60 | 0.68 | 0.28 | 0.28 |
| Level of study | | | | | | | | |
| PGY1 | 28(21.9) | 22.12 | 22.32 | 4.75 | 34.32 | 5.05 | 2.19 | 3.70 |
| PGY2 | 29(22.7) | 21.69 | 28.75 | 6.90 | 33.83 | 5.19 | 3.13 | 4.13 |
| PGY3 | 27(21.1) | 21.74 | 24.44 | 6.04 | 33.37 | 5.10 | 2.23 | 3.99 |
| PGY4 | 30(23.4) | 21.80 | 23.00 | 8.27 | 34.23 | 4.99 | 2.81 | 3.96 |
| PGY5 | 4(3.1) | 16.75 | 19.00 | 10.00 | 29.00 | 5.02 | 2.44 | 4.39 |
| PGY6 | 2(1.6) | 25.00 | 22.50 | 6.00 | 33.00 | 5.50 | 2.08 | 4.62 |
| SUPP | 8(6.3) | 22.5 | 20.63 | 6.13 | 22.25 | 4.74 | 3.33 | 4.55 |
| P-value | | 0.59 | 0.41 | 0.36 | 0.17 | 0.87 | 0.04 | 0.46 |
| Monthly income (USD) | | | | | | | | |
| 0-500 | 23(18.0) | 23.13 | 26.17 | 4.91 | 35.96 | 4.97 | 2.45 | 3.70 |
| 500-1000 | 37(28.9) | 21.08 | 21.78 | 5.84 | 33.12 | 5.09 | 2.80 | 4.21 |
| 1000-1500 | 31(24.2) | 22.48 | 25.03 | 8.29 | 31.87 | 5.08 | 2.80 | 4.42 |
| 1500-2000 | 35(27.3) | 21.17 | 25.26 | 7.26 | 31.51 | 5.09 | 2.43 | 4.64 |
| >2000 | 2(1.6) | 18.00 | 13.50 | 2.50 | 43.50 | 4.96 | 2.83 | 3.80 |
| P-value | | 0.38 | 0.43 | 0.18 | 0.36 | 0.98 | 0.67 | 0.02 |

Stress and burnout characteristics

The perceived stress scale (PSS): Mean PSS score for our population was 21.7 ± 5.3 and 60.9% of participants reported stress levels in the middle and upper tertiles. Females had significantly higher mean levels of perceived stress than males (22.9 vs 20.82 respectively, $P=0.03$). Perceived stress was higher among residents in the age group 20-25 years, but this was not statistically significant ($P=0.41$). Residents from Protestant religious background had higher perceived stress than those of other religions ($P=0.05$). Similar levels were reported across clinical specialties, marital statuses, sponsorship groups, and income levels.

The Maslach Burnout Inventory (MBI): Burnout was mainly driven by emotional exhaustion, with 65.7% of

residents having mean scores in the middle and upper tertiles of emotional exhaustion. Depersonalization was found in 39.9% of the population, with highest scores recorded among PGY5 residents ($P=0.36$). Lowest levels of personal accomplishment were found in 57.8% of residents. Emotional exhaustion was highest among PGY2 residents and those with monthly income of less than 500USD. However, these relationships were not significant statistically. General surgery, otorhinolaryngology and anaesthesia had the highest numbers of residents with emotional exhaustion, $p=0.025$. Compared to those with higher income, residents with income less than 500USD per month had lower scores for personal accomplishment (39.96 ± 8.56 vs 43.5 ± 2.12 , $P=0.021$). Similar levels of self-accomplishment were recorded among other demographic classes.

Burnout clinical subtypes questionnaire: The most prevalent burnout clinical subtype in our population was the frenetic subtype, with mean score of 5.06 ± 0.86 (Table 2). The under-challenged subtype was the least prevalent with mean score of 2.64 ± 1.31 . However, non-surgical

residents were more likely to be under-challenged (AOR=0.751 $p=0.04$). Residents with supplementary years were more likely to be under-challenged $P=0.03$. High monthly income was correlated with high worn out subtype in our population ($P=0.02$).

Table 2: The 36-item burnout clinical subtype questionnaire

| BSQ-36 | Mean | SD | Median | Q1 | Q3 |
|-------------------------|------|------|--------|------|------|
| Frenetic | 5.06 | 0.86 | 5.08 | 4.67 | 5.83 |
| Involvement | 4.87 | 0.91 | 4.75 | 4.5 | 5.25 |
| Ambition | 5.62 | 1.01 | 5.75 | 5.25 | 6.25 |
| Overload | 4.68 | 1.34 | 4.87 | 4.00 | 5.5 |
| Under-challenged | 2.64 | 1.31 | 2.41 | 1.58 | 3.46 |
| Indifference | 2.37 | 1.22 | 2.00 | 1.5 | 2.94 |
| Boredom | 2.86 | 1.47 | 2.50 | 1.56 | 6.75 |
| Lack of development | 2.68 | 1.50 | 2.25 | 1.25 | 3.75 |
| Wornout | 4.01 | 1.1 | 4.00 | 3.30 | 4.67 |
| Lack of control | 4.50 | 1.28 | 4.75 | 3.75 | 5.50 |
| Lack of acknowledgement | 4.54 | 1.26 | 4.50 | 3.75 | 5.50 |
| Neglect | 2.99 | 1.45 | 2.75 | 2.00 | 4.00 |

DISCUSSION

Stress is generally an individual's response in the face of experiences that may be construed as threatening or challenging. Burnout is a work-related cluster of symptoms presenting as emotional exhaustion, depersonalization and decreased sense of personal accomplishment². Stress is commonplace among medical students, residents and practicing health care professionals¹⁰. In this study, we sought to describe perceived stress and burnout experienced by postgraduate students in the University of Nairobi clinical residency programs in terms of the prevalence, clinical subtypes and socio-demographic determinants.

Perceived stress was higher in this study than what has been recorded for the general population, but comparable to other medical training institutions across Africa and the world^{8,11-13}. This may be expected as residents battle with finding a balance between work, school and their personal lives. Long working hours including weekends may mean sleep deprivation which could be a contributing factor to high stress levels. Apart from gender, there were no other significant associations between perceived stress and other demographic variables. Various studies have consistently showed women reporting higher levels of stress than men^{8,14}. This may be due to the differential roles and burdens with everyday living relating to social status borne by women relative to men.

Our study shows that more than half of the clinical residents are emotionally exhausted by their school and work. This may be related to circumstances surrounding their work such as, work environment as have been shown in other studies in the same setting¹⁵. University of Nairobi being one of the top universities in Africa might mean the learning and work environment is very competitive and residents exert extra efforts to the point of burnout, to maintain the standards. Contrary to other settings where depersonalization was a major driver of burnout^{16,17}, this parameter was the least reported in our setting. This may be due to relatively rare instances of reported conflicts between residents, consultants, senior colleagues, members of staff and administrative staffs, which are main sources of depersonalization in other settings¹⁷. Workload related burnout and too frequent night shifts are frequently reported as causes of depersonalization. Residents in this setting may have developed good coping strategies, though this was not addressed in this study. As found in our study, low monthly income was associated with a decreased sense of personal achievement. This has also been found in other studies¹⁸. This is true in situations where residents must incur heavy debts to sponsor their residency programs. Though many more residents were sponsored by the Government of Kenya in our setting, residents still needed financial support to meet family and social responsibilities in addition to increasing cost of living in the country.

The frenetic subtype of burnout was most prevalent in this study. This subtype encompass ambition which is the main driver of burnout. These individuals become so ambitious that they get so involved with achieving their goals to the point of neglecting their personal lives. This is true of our population as the job market is competitive and residents must exert themselves to be the best to guarantee better job placement on completion of their studies. Similar findings have been reported in other settings^{6,19}. Surgical residents had lower levels of the under-challenged subtype. Surgery is generally engaging, and this might be the reason for low levels. This finding that residents with supplementary years had a high prevalence of the under-challenged subtype which may indicate that these individuals, after exerting so much efforts to succeed to no avail, rolled over to neglect, lack of development and boredom. This becomes dangerous as it increases the risk of failing again after failing once. This is a special group of residents in which strategies must be put in place to assist them reach their life goals.

CONCLUSION

Prevalence of stress and burnout was high among our clinical residents and burnout was largely driven by emotional exhaustion. The most prevalent clinical subtype was the frenetic subtype. Management strategies of stress and burnout should be geared towards helping clinical residents find a balance between work, school and their personal lives. Financial support may be beneficial. We recommend larger multicenter studies in our setting which aim at elucidating more determinants of burnout and coping mechanisms employed by clinical residents of the University of Nairobi.

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Conflict of interest: The authors declare that there is no conflict of interest.

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LARYNGEAL TUBERCULOSIS AT THE KENYATTA NATIONAL HOSPITAL: A RARE EXTRAPULMONARY OCCURRENCE: CASE REPORT

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ABSTRACT

Laryngeal tuberculosis is a rare disease often misdiagnosed as laryngeal carcinoma. We present a case report of a 37 year old male with laryngeal complaints and a laryngeal lesion mistakenly diagnosed as laryngeal carcinoma which however turned out to be laryngeal tuberculosis. We present this case report to raise the clinicians index of suspicion of laryngeal tuberculosis as a differential diagnosis.

Key words: Laryngeal tuberculosis

INTRODUCTION

Laryngeal Tuberculosis (LTB) is a rare extra-pulmonary entity. Its prevalence has reduced from 25-40% in the pre-antibiotic era to less than 1%¹⁻³. It is often misdiagnosed as laryngeal carcinoma. The treatment of the two varies immensely and so does the prognosis. Correct diagnosis requires a high index of suspicion. Kenya is ranked among the top 30 countries with a high tuberculosis burden with an incidence of 299/100000⁴. Laryngeal tuberculosis should hence be taken strongly into consideration as a differential for laryngeal lesions.

We present this case report as a way of raising the clinicians index of suspicion of laryngeal tuberculosis as a differential diagnosis of laryngeal carcinoma like presentation.

CASE REPORT

The case report is of a 37 year old male patient who was referred to Kenyatta National Hospital (KNH) with grade IV dysphagia and a presumptive diagnosis of a left supraglottic laryngeal carcinoma with spread to the left pyriform fossa following an OGD (Figure 1) at a peripheral facility. The patient was referred for gastrostomy tube insertion and further management. ENT review in KNH noted hoarseness of voice for 1 year and unintentional weight loss (73kgs to 42kgs) with progressive dysphagia (not swallowing saliva) and odynophagia for 8 months. There was no history of chronic cough, chest pains or night sweats. There were also no otologic or nasal complaints. He had a 3.5 pack years smoking history and a history of alcohol consumption (mixed alcoholic brews for 16 years). He was a plumber by profession and was married with three children. There was no history of contact with a person with tuberculosis prior to presentation.

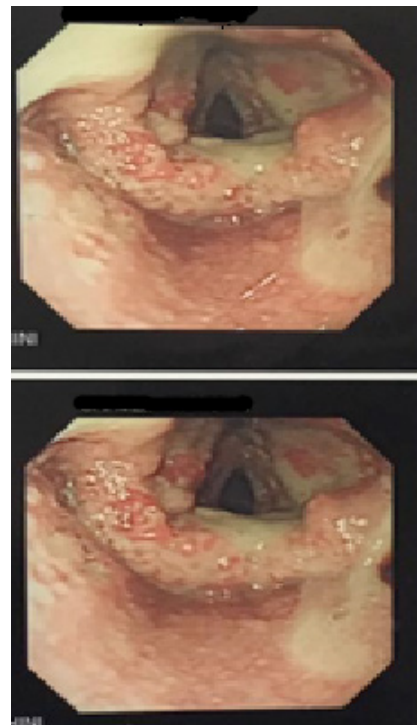


Figure 1: Image of OGD done at a peripheral facility

On examination he was sick looking, wasted, dehydrated, however he was not in respiratory distress. On oral exam, he had poor oral hygiene with pooling of saliva in the oral cavity. There was no oral thrush or oral cavity lesions. His tonsils were not enlarged and were also not inflamed. Nasal and otologic examination were normal. There was no cervical lymphadenopathy and he had a normal laryngeal framework and crepitus. Chest exam revealed bilateral reduced breath sounds.

Laboratory and radiological investigations were requested. The haemogram and renal function tests were normal. Tripple serology (HIV, HBsAg, HCV) was negative. CT scan neck done showed fullness of

the left pyriform sinus with suspicious ulceration of the left supraglottic region (Figure 2). Chest X-ray done showed a miliary pattern (Figure 3). The patient was then scheduled for a direct laryngoscopy, biopsy, oesophagoscopy and gastrostomy tube since the OGD on referral reported obstruction at the cricopharyngeus. Direct laryngoscopy revealed bilateral oedematous aryepiglottic folds worse on the right with a right false cord ulcerofungating mass. There was also an isolated right tip of epiglottis cookie bite lesion. Oesophagoscopy noted oedematous pyriform fossa bilaterally, however there was no physical obstruction and a 12x 16x30 oesophagoscope passed freely into the oesophagus. Multiple biopsies of the laryngeal lesions were taken and a feeding gastrostomy tube fashioned.

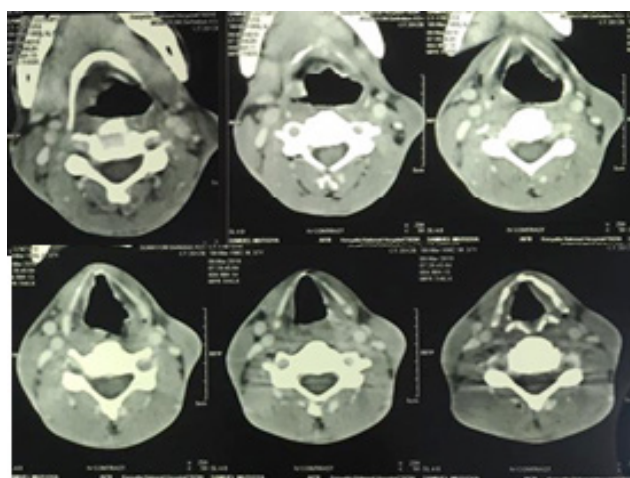


Figure 2: CT scan neck finding axial cuts showing fullness of left pyriform sinus with left supraglottic ulceration

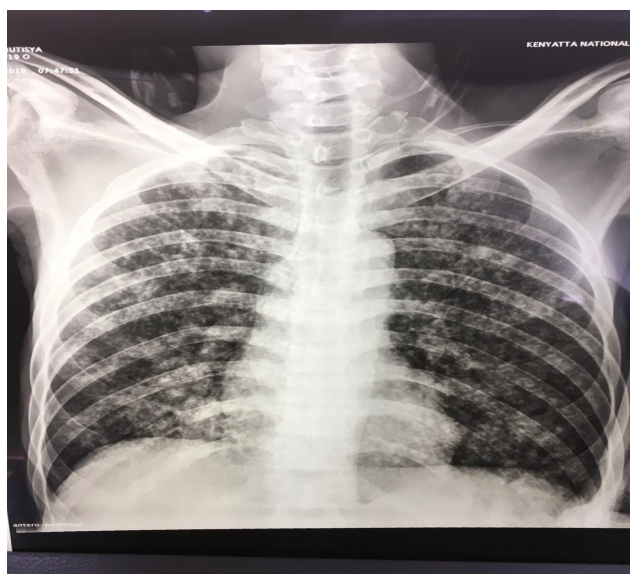


Figure 3: Chest radiograph of the same patient showing a miliary picture (diffuse millet seed sized nodular opacities)

Biopsies were sent for histology and ZN staining. Histology showed chronic inflammation and ZN staining was positive for Acid fast bacilli. Sputum gene x pert and AFB were positive for tuberculosis.

The patient was diagnosed with laryngeal tuberculosis secondary to pulmonary tuberculosis and started on intensive phase of TB treatment with rifampicin, pyrazinamide, isoniazid, ethambutol for 2 months, followed by a continuation phase of rifampicin pyrazinamide for 4 months.

DISCUSSION

Laryngeal tuberculosis is the commonest cause of granulomatous diseases affecting the larynx⁵. The larynx may be affected either through primary or secondary spread. Primary tuberculosis of the larynx arises from direct colonization of the larynx by the mycobacterium bacillus. Secondary tuberculosis of the larynx is through spread from a primary site usually the lungs either through air droplets or haematogenous spread⁶. In the case of the patient in review, the spread to the larynx was more likely secondary given the active lung tuberculosis and the miliary picture.

Laryngeal tuberculosis commonly affects males in the age group of 30 - 84 years⁷. The most common presentation of laryngeal tuberculosis is hoarseness^{2,8,9}, odynophagia^{10,11} and dysphagia¹¹. Other symptoms include cough, dyspnea, stridor and haemoptysis⁸. The patient in question only had hoarseness and dysphagia. These symptoms are also characteristic of laryngeal carcinoma. The patient had a positive smoking and alcohol intake history that further added weight to the diagnosis of laryngeal carcinoma as a differential. Laryngoscopy findings in laryngeal tuberculosis mirror those of laryngeal carcinoma. Findings include ulcerofungating mass lesions, whitish ulcerative lesion non -specific inflammatory lesion and polypoid lesion. The patient had a left false vocal cord ulcerofungating mass lesion. He however had another cookie bite lesion on the right tip of his epiglottis. Shin *et al*¹² reported noting two or more laryngeal lesions in secondary laryngeal tuberculosis as opposed to one lesion in primary laryngeal TB.

The chest radiograph of this patient showed a miliary pattern (diffuse millet seed sized nodular opacities). His sputum for AFB was also positive for tuberculosis. He however did not have the other classic features for active pulmonary tuberculosis i.e. chronic cough and night sweats. Miliary tuberculosis is disseminated tuberculosis and it commonly occurs in the immunocompromised¹³. The patient was not seropositive nor diabetic. He however was malnourished which could be attributed to the prolonged odynophagia and dysphagia post infection. The chest X-ray findings triggered the testing for sputum for AFB and the consideration of laryngeal tuberculosis as the cause of the laryngeal disease. The patient had been symptomatic for 1 year. Had the chest X-ray been done earlier, the diagnosis of laryngeal tuberculosis may have been clinched earlier.

CONCLUSION

Laryngeal tuberculosis may be misdiagnosed as laryngeal carcinoma. A high index of suspicion is needed to diagnose it and this is aided by chest X-ray findings in secondary laryngeal tuberculosis. Demonstration of mycobacteria bacilli on ZN staining of laryngeal lesion biopsies is the definitive diagnosis for laryngeal tuberculosis.

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BILATERAL SUDDEN PROFOUND SENSORINEURAL HEARING LOSS IN A PATIENT WITH CHRONIC MYELOID LEUKEMIA: CASE REPORT

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ABSTRACT

Sudden hearing loss is a rare complication of Chronic Myeloid Leukaemia (CML). In our report, we describe the case of a 41-year-old male who presented as an emergency, was diagnosed with CML, Diabetes mellitus and hypertension and admitted for management. His initial white blood cell count was 812000cells/mm³ and he was severely anaemic. The patient developed sudden bilateral hearing loss in the course of admission with a pure tone audiometric assessment revealing bilateral profound sensorineural hearing loss. The patient was started on imatinib with a plan for 2 weekly audiology reviews, but was lost to follow up. This report suggests the hyperviscosity syndrome as a cause of focal neurological manifestations, as well as a synergistic effect of cardiovascular risk factors in hearing loss.

Key words: Chronic myeloid leukemia, Sensorineural hearing loss, Hyperviscosity syndrome

INTRODUCTION

Sudden sensorineural hearing loss in chronic myeloid leukemia is very rare, with a few case reports recorded in literature. The hyperviscosity syndrome demonstrated in myeloproliferative disorders has been implicated as a cause of sensorineural hearing loss. Hyperleukocytosis is responsible for an increase in blood viscosity, and is defined as white cell counts greater than 100000cells/mm³¹. The result is an increase in resistance to blood flow, vascular stasis and therefore hypoperfusion of several organs. Patients tend to present with visual disturbances, bleeding disorders and focal neurological signs¹. In our case report, we discuss a patient with CML who developed sudden sensorineural hearing loss in the course of admission.

CASE PRESENTATION

Case of a 41-year-old male who presented to our health facility with complaints of left upper quadrant abdominal pains and dizziness of one-month duration. Patient was admitted and was found to be severely anaemic (Hb 7.4g/dl) during the course of hospitalization. His full blood count revealed a white blood cell count of 812000cells/mm³, with a differential count showing 90% neutrophils, 3.5% lymphocytes, 4.1% monocytes, 1.8% eosinophils and 0.6% basophils. Genetic studies revealed the Philadelphia chromosome and BCR-ABL gene, and a diagnosis of Chronic Myeloid Leukemia (CML) was made. The patient was also newly diagnosed of type

2 Diabetes mellitus (glycated haemoglobin at 13%) and hypertension during this admission. Following diagnosis of CML, treatment was immediately started with hydroxyurea 500mg thrice daily, and transfusion of 4 units of blood. He also received mixtard 16 IU morning and 8IU evening, metformin 500mg twice daily, lersatan 100mg once daily. Allopurinol 300mg twice daily was added to his treatment two days later.

Eight days following admission, the patient complained of sudden bilateral hearing loss. His hearing had been normal on admission with no previous history of ear disease. A physical examination showed normal external auditory canals bilaterally, with both tympanic membranes intact. Cranial nerve examination was normal. There was no response to tuning fork tests. A pure tone audiometric assessment revealed bilateral profound sensorineural hearing loss with no response at 120decibels across all frequencies (Figure 1). At the time of ENT examination on day 8 of admission, the WBC had dropped to 700000cells/mm³. A plan to carry out CT scans of the brain and temporal bones was made, but due to the patient's financial constraints, these could not be done.

Still in the course of his admission, the patient developed priapism, but declined corpora carvenosa shunting. He was transferred to another facility to be initiated on imatinib, and was given a review at the ENT clinic for two-weekly audiometric assessments. The patient however did not show up for the reviews. Phone calls were made regularly to the patient's spouse and the report was that the patient was still deaf a year after the onset of his illness.

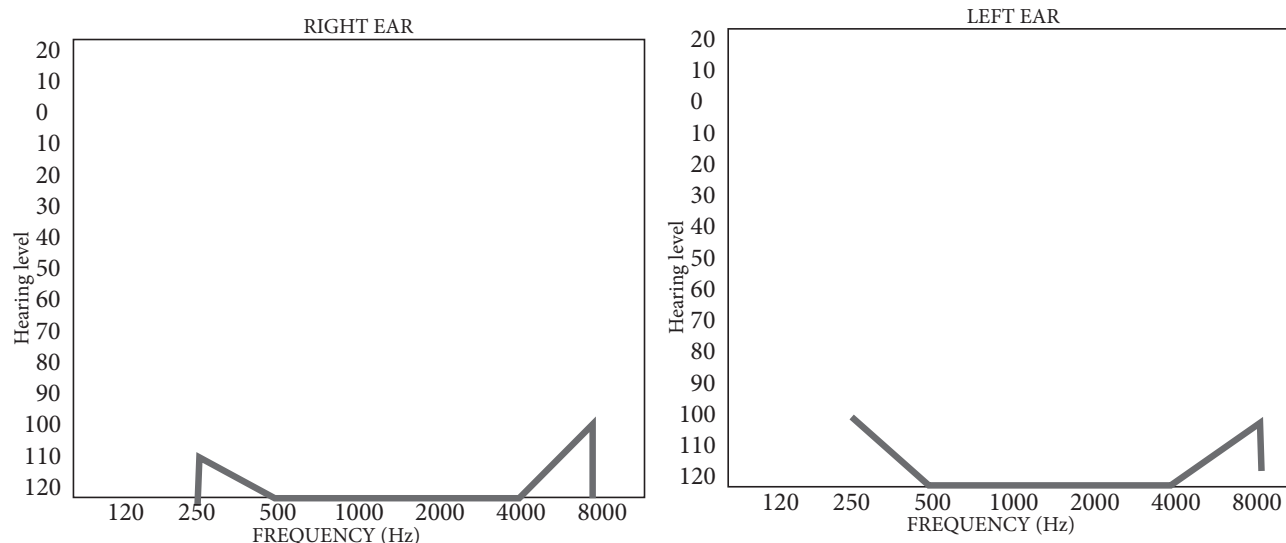


Figure 1: Pure tone audiometric assessment of the patient

DISCUSSION

Bilateral sudden profound sensorineural hearing loss in CML is rare, with several case reports postulating different aetiologies. This case was reported at the Kenyatta National Hospital in Kenya, and is the first of its kind to be reported. Critical levels of WBC are said to be greater than 300000cells/mm³ and can be associated with hyperviscosity syndrome. In our report, our patient had initial WBC of 812000cells/mm³, more than twice the critical levels. A case was described by Amancio *et al*¹ associated hyperviscosity syndrome and acute hearing loss in a patient initially presenting with hearing loss and eventually diagnosed with CML on admission. The patient had leukocyte counts of 645000cells/mm³ and anaemia of 7g/dl. Hydration therapy, hydroxyurea, allopurinol, dexamethasone and leukapheresis were some of the treatment options applied. Hearing had not improved by the time he was discharged home, about 1 month following admission.

Resende *et al*² reported a case similar to ours with significant hyperleukocytosis and bilateral hearing loss as well as other neurological symptoms. Their patient had bilateral hypoacusis confirmed by Brainstem Auditory Evoked Potentials (BAEP), and a brain MRI showing areas of subcortical ischaemic infarction. Their patient did well on 5 sessions of leukapheresis and hydroxyurea 4g/day, with significant resolution of all clinical and laboratory parameters. Our institution does not offer leukapheresis as a treatment option. Considering his financial status, our patient was unable to get any imaging tests or more detailed audiological assessments. Being lost to follow up, we were unable to describe the resolution of his symptoms on imitinib as this treatment was carried out in another health facility.

Leukapheresis is a procedure in which blood of the patient is passed through a leukapheresis machine, which separates and collects the WBCs cells, while

returning the rest of the patient's blood with or without addition of replacement fluid such as colloid, human albumin, or a crystalloid solution. This procedure has been shown to reduce the WBC count by 10-70% in just one session¹. Prospective studies on the efficacy of leukapheresis on CML are lacking.

Several other case reports cite hearing loss as the initial manifestation of CML^{4,5}. Chih-Cheng Hsiao *et al*⁴ described the case of a 12 year old who presented with a 2 day history of sudden right sided hearing loss, with the left side later involved in the course of her treatment. CML was diagnosed in the course of her medical assessment. In her case, despite several interventions including hydration therapy, allopurinol, and hydroxyurea (30 mg/kg/day, per os), interferon-alpha, leukapheresis and cytarabine, she deteriorated and died on day 9 of admission.

Our case report makes mention of comorbidities such as Diabetes mellitus and hypertension which were diagnosed in our patient on admission. Type 2 diabetes has still not been proven to be a sure cause of sudden sensorineural deafness. However, several studies try to bring out a relationship between these comorbidities and hearing loss^{6,7}. Aimoni *et al*⁸ in a case controlled study revealed even greater risk of idiopathic sudden sensorineural hearing loss in patients with more than one cardiovascular risk factor. The patient in this report had high glycated haemoglobin levels of 13% which have also been shown to increase the risk of hearing loss^{6,7}.

CONCLUSION

There is a possibility that the patient presented in our case report developed bilateral sudden profound sensorineural hearing loss due to hyperleukocytosis and resultant hyperviscosity of blood. This may have

been worsened by the presence of cardiovascular diseases at the time of presentation. Diagnosis and intervention should be timely in order to improve on disease outcomes and prevent disease progression and complications.

Conflict of interest: The authors declare that there is no conflict of interest regarding the publication of this case report.

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