

Sociodemographic Distribution of Bacterial and Fungal External Eye Infections Among Children Attending a Tertiary Hospital in Southeast, Nigeria

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ABSTRACT

This study which is a prospective cross-sectional survey ascertained the distribution of bacterial and fungal external eye infections among children attending the Federal University Teaching Hospital, Owerri, Imo State, Southeast Nigeria. Owerri comprises Owerri Municipal, Owerri West and Owerri North Local Government Areas. The sample population was 460 subjects, aged 1-17 years. Ocular samples were collected with sterile swabs from infected eyes for culture and identification to ascertain the type of infection, whether bacterial or fungal. Data were analysed with chi-square, analysis of variance (ANOVA), correlation test and simple percentage using statistical package for social sciences (SPSS) version 20.1 (P-value ≤ 0.05). The most occurring eye infection was bacterial conjunctivitis (74.6%), followed by blepharitis (11.3%), bacterial keratitis (5%), hordeolum (3.9%), lid abscess (2.2%) and dacryocystitis (1.7%). Fungal keratitis (1.3%) was the least and only fungal external eye infection seen. Bacteria were found to be the major cause of conjunctival and corneal infections in the eye (86.09%). Bacterial conjunctivitis was most recorded among the 1-3 age group (93.1%), followed by 4-7 age group (80.6%), 8-11 age group (70.6%), 12-14 age group (65%) and 15-17 age group (48.7%). It occurred highest among the males (77.6%) than the females (71.4%). Fungal keratitis was recorded highest (5.1%) among the 15-17 age group followed by 12-14 age group (2.5%), while no case was seen among the other age groups. Owerri West recorded the highest bacterial and fungal external eye infections (43.26%), followed by Owerri North (35.86%) and Owerri Municipal (20.9%). Generally, there was higher rate of external eye infection among the males (50.65%) than females (49.34%).

Keywords: External eye infection, Conjunctivitis, Children, Age, Sex, Residential area.

INTRODUCTION

External ocular infections can occur in both children and adults, irrespective of gender. They may present with redness, discharge and tearing, among others,¹ thus exert heavy burden on ocular health. Hence, this study on sociodemographic distribution of

bacterial and fungal external eye infections among children attending the Federal University Teaching Hospital, Owerri, Imo State, Southeast Nigeria.

It is usually tasking to determine distinctively, infective from non-infective conditions, therefore, confirmation of

clinical diagnosis by microscopic examination and culture of clinical samples becomes necessary. The sociodemographic characteristics of the subjects (age, sex and residential area) were determined and used to assess the level of occurrence of bacterial and fungal external eye infections among these children.

MATERIALS & METHODS

A total of 460 subjects were used for this study. It is a cross-sectional survey of children presenting with external eye infections. It was carried out in two phases: (i) on-site inspection (clinical examination and specimen collection) and (ii) laboratory investigation to ascertain the type of external eye infection

The subjects used for this study had no previous history of the use of antibiotics or recent eye surgery (<3months). With the aid of sterile swab sticks, ocular samples were collected from each eye and sent to the laboratory to ascertain the type of external eye infection.

The dependent variables were the bacterial and fungal external eye infections while the independent variables were the demographic characteristics, i.e. age, sex and residential area. Subjects were examined for different ocular clinical features like conjunctivitis, blepharitis, keratoconjunctivitis, keratitis, lid abscess and blepharoconjunctivitis

Research Instruments

The instruments for data collection included semi-structured questionnaire, sterile gloves, sterile swab sticks, slit lamp biomicroscope, bard Parker blade #15, normal saline, topical anaesthetic, coolant ice packs and ice box.

Data collection procedure

Socio-demographic characteristics were collected from each subject with the aid of their parents/guardian, using a pretested structured questionnaire. Clinical data were collected and sent to the laboratory on presentation with external eye infections to ascertain the type of external eye infection.

STATISTICAL ANALYSIS

Statistical analysis was done with the SPSS version 20.1, using chi square, analysis of variance (ANOVA), correlation and simple percentage. P-value less than or equal to 0.05 was considered statistically significant.

RESULT

Table 1: Distribution of children according to Age and Sex

Age (years)	Frequency (%)	Male (%)	Female (%)
1-3	117 (25.43)	61 (25.74)	56 (25.11)
4-7	68 (14.78)	35 (14.77)	33 (14.80)
8-11	88 (19.13)	45 (18.99)	43 (19.28)
12-14	95 (20.65)	48 (20.25)	47 (21.08)
15-17	92 (20.00)	48 (20.25)	44 (19.73)
Total	460 (100)	237 (100)	223 (100)

Table 2: Distribution of children according to Residential area

Residential area	Frequency (%)	Male (%)	Female (%)
Owerri Municipal	154 (33.48)	78 (32.91)	76 (34.08)
Owerri West	154(33.48)	79(33.33)	75 (33.63)
Owerri North	152 (33.04)	80 (33.76)	72 (32.29)
Total	460 (100)	237 (100)	223 (100)

Table 3: Distribution of children according to Age, Sex and Residential area

Age (years)	Owerri Municipal		Owerri West		Owerri North		Total
	M	F	M	F	M	F	
1-3	20(25.64)	18(23.68)	22(27.84)	20(26.67)	19(23.75)	18(25.00)	117(25.43)
4-7	11(14.10)	10(13.16)	12(15.19)	12(16.00)	12(15.00)	11(15.28)	68(14.78)
8-11	14(17.95)	15(19.74)	16(20.25)	15(20.00)	15(18.75)	13(18.06)	88(19.13)
12-14	16(20.51)	17(22.37)	15(19.00)	15(20.00)	17(21.25)	15(20.83)	95(20.65)
15-17	17(21.80)	16(21.05)	14(17.72)	13(17.33)	17(21.25)	15(20.83)	92(20.00)
Total	78(16.96)	76(16.52)	79(17.17)	75(16.30)	80(17.40)	72(15.65)	460(100)

Table 4: Distribution of bacterial and fungal external eye infections among participants

Clinical features	Frequency (%)
Bacterial Conjunctivitis	343 (74.6)
Blepharitis	52(11.3)
Bacterial Keratitis	23 (5.0)
Hordeolum	18 (3.9)
Lid abscess	10 (2.2)
Dacryocystitis	8 (1.7)
Fungal Keratitis	6 (1.30)
Total	460(100)

Table 5: Distribution of bacterial and fungal external eye infections among participants according to age, sex and residential area

Clinical features	Age					Sex		Residential Area		
	1-3 (%)	4-7 (%)	8-11 (%)	12-14 (%)	15-17 (%)	Male (%)	Female (%)	Owerri Municipal (%)	Owerri West (%)	Owerri North (%)
Bacterial conjunctivitis (n=343)	122 (93.1)	71 (80.6)	60 (70.6)	52 (65.0)	38 (48.7)	181 (77.6)	162 (71.4)	79 (82.3)	143 (71.9)	121 (73.3)
Blepharitis (n= 52)	1 (0.76)	8 (9.1)	12 (13.8)	13 (16.25)	18 (23.1)	19 (8.2)	33 (14.5)	8 (8.3)	25 (12.6)	19 (11.5)
Bacterial Keratitis (n=23)	0 (0)	1 (1.1)	3 (3.4)	7 (8.75)	12 (15.4)	9 (3.9)	14 (6.2)	4 (2.86)	10 (5.77)	9 (5.5)
Hordeolum (n=18)	0 (0)	3 (3.4)	6 (6.9)	4 (5.0)	5 (6.4)	10 (4.3)	8 (3.5)	3 (4.2)	6 (5.0)	9 (5.5)
Lid abscess (n=10)	7 (5.34)	3 (3.4)	0 (0)	0 (0)	0 (0)	6 (2.6)	4 (1.8)	1 (1.0)	5 (2.5)	4 (2.4)
Dacryocystitis (n=8)	0 (0.0)	1 (1.1)	4 (4.6)	2 (2.5)	1 (1.3)	4 (1.7)	4 (1.8)	1 (1.0)	5 (2.5)	2 (1.2)
Fungal keratitis (n=6)	0 (0)	0 (0)	0 (0)	2 (2.5)	4 (5.1)	4 (1.7)	2 (0.9)	0 (0)	5 (2.5)	1 (0.6)
Total	130 (28.26)	87 (18.91)	85 (18.47)	80 (17.39)	78 (16.95)	233 (50.65)	227 (49.34)	96 (20.90)	199 (43.26)	165 (35.86)

DISCUSSION

The mean age of the subjects in this study was 9.31 ± 0.89 . Those in age group 1-3 were 177 (25.43%), making up the majority of the study population, while those in the 4-7 age group were 68 (14.78%), which was the least of the study population. Others were those in the 8-11 age group making up 88 (19.13%), those in the 12-14 age group making up 95 (20.65%) and those in the 15 - 17 age group, who made up the remaining 92 (20%) of the study population.

Following the distribution of the male subjects according to age, those in the 1-3 age group made up the majority (25.74%) of the male population, those in 4-7 age group made up 14.77% which was the least population of the male subjects. Those in 8-11 age group made up 18.99%, 12-14 and 15-17 age groups made up 20.25% of the population respectively.

The distribution of the female subjects according to age, showed those in the 1-3 age group made up the majority (25.11%) of the female population, while those in 4-7 age group made up the least population (14.80%) of the female subjects. Those in 8-11 age group made up 19.28%, those in 12-14 made up 21.08% and those in 15-17 age group made up 19.73% of the study population. Based on the distribution of the study population according to sex, 237 (51.52%) were males while 223 (48.48%)

were females. Hence, the males made up the larger sex of the study population.

From the results 154 (33.48%) of the subjects reside in Owerri Municipal and Owerri West respectively, while 152(33.04%) reside in Owerri North. 78(32.91%) of the male subjects reside in Owerri municipal, 79(33.33%) reside in Owerri West while 80(33.76%) reside in Owerri North. For the female subjects, 76(34.08%) reside in Owerri Municipal, 75(33.63%) reside in Owerri West while 72(32.29%) reside in Owerri North. These results show an equal population of male subjects residing Owerri Municipal and Owerri West while the highest population of the female subjects reside in Owerri Municipal.

The number of male subjects in the 1-3 age group residing in Owerri Municipal, Owerri West and Owerri North were 20(25.64%), 22(27.84%) and 19(23.75%) respectively with highest population residing in Owerri West. For those in the 4-7 age group, 11(14.10%) of the male subjects reside in Owerri Municipal, 12(15.19%) reside in Owerri West and 12(15%) reside in Owerri North, with the least population of this age group residing in Owerri Municipal.

Among those in the 8-11 age group, 14(17.95%) of the male subjects reside in Owerri Municipal, 16(20.25%) reside in Owerri West, while 15(18.75%) reside in Owerri North, having the highest population

in Owerri West. In the 12-14 age group, 16(20.51%) of the male subjects reside in Owerri municipal, 15(19%) reside in Owerri West, while 17(21.25%), the highest population in this age group, reside in Owerri North. For those in the 15-17 age group, 17(21.80%) of the male subjects reside in Owerri Municipal, 14(17.72%) reside in Owerri West, while 17(21.25%) reside in Owerri North, with the least population in this age group residing in Owerri West.

For the female subjects, those in the 1-3 age group residing in Owerri Municipal were 18(23.68%), Owerri West 20(26.67%) and Owerri North 18(25%), with highest population residing in Owerri West. Those in the 4-7 age group, had 10(13.16%) of the female subjects residing in Owerri Municipal, 12(16%) residing in Owerri West and 11(15.28%) residing in Owerri North, with the least population of this age group residing in Owerri Municipal. In the 8-11 age group, 15(19.74%) of the female subjects reside in Owerri Municipal, 15(20%) reside in Owerri West, while 13(18.06%) reside in Owerri North, having the highest population in Owerri West.

Among those in the 12-14 age group, 17(22.37%) of the female subjects reside in Owerri municipal, 15(20%) reside in Owerri West, while 15(20.83%). The highest population of subjects in this age group reside in Owerri Municipal. For those in the 15-17 age group, 16(21.05%) of the female subjects reside in Owerri Municipal, 13(17.33%) reside in Owerri West, while 15(20.83%) reside in Owerri North, with the least population of this age group residing in Owerri West. Over all, the highest population of male subjects reside in Owerri North, while the highest population of female subjects reside in Owerri municipal. Generally, the highest population of subjects in the 1-3, 4-7 and 8-11 age groups was seen among those residing in Owerri West. In the 12-14 and 15-17 age groups, those residing in Owerri Municipal had the highest population.

The most occurring ocular infection was bacterial conjunctivitis (74.6%), followed with a wide marginal difference by blepharitis and bacterial keratitis. Fungi were identified as the second most prevalent cause of corneal ulcers. This implies bacteria were the major cause of conjunctival and corneal infections in the eye (86.09%) amongst the participants. This result is consistent with other studies carried out in Nigeria, Ethiopia and Sudan, where conjunctivitis was highly associated with culture positive bacterial infections of the eye.²⁻⁴ It is also consistent with the findings by Alfonso⁵ and Liang,⁶ where bacterial conjunctivitis was the most frequent form of infective conjunctivitis.

Blepharitis (11.3%) and bacterial keratitis (5%) were also part of the external eye infections seen among the participants in this study, with blepharitis having a higher percentage. This result is consistent with the studies in Southern Ethiopia⁷ where blepharitis had a higher rate of occurrence (19.6%) than bacterial keratitis (11%) among the external eye infections seen. Hordeolum made up 3.9% of the infections seen while lid abscesses accounted for 2.2% and dacryocystitis, 1.7%. These findings are in contrast with previous studies where there was higher rate of occurrence of dacryocystitis than hordeolum and lid abscess seen as the least occurring external eye infection.^{3,7}

A high level of bacterial conjunctivitis was seen among all the age group studied. However, it was most prevalent among the 1-3 age group (93.1%) followed by 4-7 age group, (80.6%), 8-11 age group (70.6%), 12-14 age group (65%) and 15-17 age group (49.7%). This may be attributable to increased rate of susceptibility to infection in babies and toddlers as their maternal immunity has been lost, before their own immunity is built and matures.

Blepharitis was mostly seen among 15-17 age group (23.1%) followed by the 12-14 age group (16.25%), 8-11 age group (13.8%), 4-7 age group (9.1%) and 1-3 age group (0.76%). This is in agreement with

the study by Ubani,² where blepharitis was mostly seen in the 12 – >18 age group. It may be associated with outbreak of acne in the face resulting from changes in puberty.^{2,7}

Cases of bacterial keratitis were mostly seen among those aged between 15-17 years (15.4%), followed by those in 12-14 age group (8.75%), 8-11 age group (3.4%) it occurred least among those in the 4-7 age group (1.1%). There was no case of bacterial keratitis seen among those in the 1-3 age group.

Hordeolum was mostly prevalent among the 8-11 age group (6.9%), followed by 15-17 age group (6.4%), 12-14 age group (5.0%) and 4-7 age group (3.4%) with no occurrence among the 1-3 age group. Lid abscess was seen only among the 0-3 and 4-7 age groups (5.34% and 3.4% respectively).

Dacryocystitis was mostly seen among those in the 8-11 age group (4.6%), followed by 12-14 age group (2.5%), 4-7 age group (1.1%), 15-27 age group (1.3%) with no occurrence among participants in 1-3 age group (0.76%).

Fungal keratitis was seen only among those in the 12-14 and 15-17 age groups with the later having a higher prevalence rate (2.5% and 5.1% respectively).

During the period of study, the distribution of infection among the male and female participants showed a higher rate of infection (50.65%) among the males than the females (49.35%). This may be based on the fact that males are more inclined to outdoor activities which make them more prone to infections/injuries than the females.⁸

Cases of bacterial conjunctivitis were predominant among the males (77.6%) than the females (71.4%) in this study. This result is in line with the research by Shiferaw *et al.*,⁹ where conjunctivitis' cases were predominant among the males than the females.

Blepharitis was mostly seen among the females (14.5%) than the males (8.2%) participants in this study likewise, bacterial

keratitis (females 6.2%, males 3.9%) and dacryocystitis (females 1.8%, males (1.7%). This result is in line with reports by Prakash *et al.*,¹⁰ Assefa *et al.*,¹¹ and Shiferaw *et al.*,⁹ where dacryocystitis was more prevalent among the females than the male participants. On the other hand, it disagrees with the studies by Shiferaw *et al.*,⁹ where cases of blepharitis were more among the male participants than the females. The males had more cases of hordeolum (4.3%) than the females (3.5%). Lid abscess were mostly seen among the males (2.6%) than females (1.8%). There were few cases of fungal keratitis though more among the males (1.7%) than the females (0.9%).

From the residential area of the participants, there was higher rate of bacterial and fungal external eye infections among those residing in Owerri West (43.26%), followed by Owerri North (35.86%) and Owerri Municipal (20.9%). Most cases of fungal eye infections were seen in Owerri West (2.5%).

CONCLUSION

Bacterial and fungal infections of the eye can give rise to a plethora of symptoms and signs like conjunctival hyperemia, presence of exudates, eyelid edema and sometimes, visual impairment.^{12,13} In this study, bacteria were the most frequent cause of external eye infections among the participants, especially, the gram-positive bacteria. Conjunctivitis was the most predominant external eye infection seen among the children. The poor/inadequate breastfeeding by mothers may have played a significant role in the prevalence of these eye infections among infants, as breast milk provides maternal immunity. At any rate, monitoring the ratio of this infectious conjunctivitis remains a major problem especially in under-developed and developing countries, as external eye infections are prevalent causes of morbidity in developing countries, more so, in rural areas. At any rate, the findings in this study imply that there is a higher level of occurrence of bacterial infections than fungal infections among

children in Owerri especially among those residing in Owerri West. Poor attitude on the part of the residents to access medical facilities in the area may also have contributed to the level of occurrence of these external eye infections in Owerri.

Declaration by Authors

Ethical Approval: Ethical clearance was gotten from the Federal University Teaching Hospital, Owerri, Imo State, Southeast Nigeria, for specimen collection from both the Eye and Pediatric Units. Consent was also gotten from subjects and their parents/guardians before inclusion in the study.

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REFERENCES

1. Alexandrakis G, Alfonso EC, Miller D. Shifting trends in bacterial keratitis in South Florida and emerging resistance to fluoroquinolones. *Ophthalmology*. 2000; 107: 1497-1502.
2. Ubani UA. Bacteriology of external Ocular Infections in Aba, South Eastern Nigeria. *Clinical and Experimental Optometry*. 2009;92(6):482-489.
3. Mazin OM, Lemya AK, Samah OM. External ocular bacterial infections among Sudanese children at Khartoum Sate, Sudan. *African Journal of Microbiology Research*. 2016;10(40):1694-1702.
4. Esenwah E. Isolation and Identification of the microorganisms most prevalent in external eye infections as seen in an eye clinic in Owerri. *Journal of Nigerian Optometric Association*. 2005;12:6-9.
5. Alfonso SA, Fawley JD, Lu X. Conjunctivitis. *Primary Care*, 2015;42:325–345.
6. Liang Q, Lu X, Wang M, et al. Study of infectious conjunctivitis among children in rural areas of Qinghai province. *Science China Life Sciences*. 2016;59(6):548-554.
7. Amsalu A, Mihret A, Delelegne D, et al. Potential bacterial pathogens of extra ocular infections and their antibiotic susceptibility pattern at Hawassa University Teaching and Referral Hospital, Southern Ethiopia. *African Journal of Microbiology Research*. 2015;9(14):1012–1019.
8. Suja C, Vinshia J, Uma Mageswari SS. Bacterial and Fungal Profile of External Ocular Infections in a Tertiary Care Hospital. *International Journal of Current Microbiology and Applied Science*. 2019;8(2):2081-2089.
9. Shiferaw B, Gelaw B, Assefa A, et al. Bacterial isolates and their antimicrobial susceptibility pattern among patients with external ocular infections at Borumeda hospital, Northeast Ethiopia. *BMC Ophthalmology*. 2015;15:103.
10. Prakash R, GirishBabu RJ, Nagaraj ER. A bacteriological study of dacryocystitis. *Journal of Clinical and Diagnostic Research*. 2012;6(4):652-656.
11. Assefa Y, Moges F, Endris M, et al. Bacteriological profile and drug susceptibility patterns in dacryocystitis patients attending Gondar University teaching hospital, Northwest Ethiopia. *BMC Ophthalmology*. 2015;15(1):1.
12. Cheesbrough M. *District Laboratory Practice in Tropical Countries*. 2nd ed. part (2). Cambridge University Press Cambridge: New York. 2006.
13. Getahun E, Gelaw B, Assefa A, et al. Bacterial pathogens associated with external ocular infections alongside eminent proportion of multidrug resistant isolates at the University of Gondar Hospital, northwest Ethiopia. *BMC Ophthalmology*. 2017;17(151):1-10.

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