Original article

Prevalence and antimicrobial susceptibility profile of Group A *Streptococcus pyogenes* among school-aged children with pharyngitis in Arba Minch, southern Ethiopia

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Summary

Streptococcus pyogenes is the most frequent cause of pharyngitis in children and may lead to further complications in the form of post-infectious syndromes. In so far, the prevalence and antimicrobial susceptibility profiles of group A *Streptococcus* among school-aged children have not been investigated in the study area, Arba Minch in southern Ethiopia. The present study aims to assess the prevalence and antimicrobial susceptibility profiles of *S. pyogenes* group among school-aged children suspected of pharyngitis at three government health institutions in Arba Minch, Ethiopia. A cross-sectional study was conducted at three government health institutions in Arba Minch during 1st March – 31st August, 2019. Demographic and associated

factors were collected by using a pre-tested structured questionnaire. Standard microbiological techniques were employed to isolate and identify *S. pyogenes*. Kirby-Bauer disk diffusion method was used to perform the antimicrobial susceptibility testing. Statistical package for Social Science (SPSS) version 25 was used to analyse the data; p-value <0.05 was considered as statistically significant. A total of 170 children were included in the study, by marginal majority females, 91 (53.5%). The prevalence of *S. pyogenes* was 15 (8.8%). Invariably, all isolates (100%) of *S. pyogenes* group A were susceptible to penicillin, clindamycin, and vancomycin. Alarmingly, 60% of *S. pyogenes* were found to be resistant to tetracycline. Lower age (ie., 5-9 years) (p-value 0.046), low monthly income (p-value 0.032) of the family and history of sore throat (p-value 0.007) were significantly associated with the prevalence of *S. pyogenes* group A among children with pharyngitis. Overall results revealed that the prevalence of GAS is comparatively similar to another study done in Ethiopia. All *S. pyogenes* group A isolates remained susceptible to the majority of antibiotics which is encouraging for clinical practice.

Key words
children, pharyngitis, Streptococcus pyogenes, antibiotic susceptibility

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Introduction

Streptococcus pyogenes (the main species of Streptococcus group A (GAS) are bacteria presenting as facultative, Gram-positive cocci, causing a wide range of diseases ranging from benign soft tissue infections and pharyngitis to severe life-threatening infections, such as streptococcal toxic shock syndrome and devastating post infectious sequelae, such as rheumatic fever and glomerulonephritis.[1,2]

Streptococcal pharyngitis is a major cause of morbidity and mortality worldwide, responsible for approximately 600 million cases and 500,000 deaths, most of which are attributable to invasive infections, acute rheumatic fever (ARF), and subsequent rheumatic heart disease.[3] Peak incidence of infections caused by *S. pyogenes* is observed between 5 to 15 years of age, accounting for 20–30% of cases.[4,5] Approximately 15% of school-aged children and 4 to 10% of adults may suffer an episode of *S. pyogenes* pharyngitis on an annual average in developed countries, whereas incidence rates in developing countries are 5 to 10 times higher.[6]

Globally, it was estimated that about 600 million cases of symptomatic *S. pyogenes* associated pharyngitis occur annually and currently, with a prevalence of 18.1 million for serious *S. pyogenes* disease; and 1.78 million new cases of the latter occuring each year. These infections are responsible for over 500,000 deaths annually, most of which occur in underdeveloped countries.[1,7]

In developing countries, pharyngo-tonsillitis caused

by β-hemolytic streptococci remains an endemic disease with an annual incidence ranging from 100-200 per 10,000 school-aged children and is a major cause of mortality linked to cardiovascular problems.[8] Rheumatic fever (RF) is reported to occur in 1-3% cases of streptococcal throat infections among children living in underprivileged conditions.[8,9] In Africa, the prevalence of *S. pyogenes* pharyngitis among children varied from country to country, ranging from 17% to 42.2%,[10,11] whereas a recent study conducted in Jimma, Ethiopia showed a prevalence rate of only 11.3%.[12]

Despite many years of extensive use, penicillin remains the drug of choice for *S. pyogenes* pharyngeal infections as well as for suppurative complications. However, reports of the failure of penicillin in eradicating *S. pyogenes* from oropharynx, possibly as a result of penicillin tolerance are now causing a major concern.[13] In contrast, resistance to macrolides is common.[10,14] The antibiotics resistance rate of *S. pyogenes* varies according to geographical conditions, fluctuations in time and community drug practices.[15]

Several host and environmental factors have been identified as having potential roles in the severity and outcome of pharyngeal infection.[16] The vast variations in the risk observed among populations around the world can be explained by environmental factors. Relative contributions by each one of these individual risks are difficult to elucidate, given that many of them overlap and most are associated with poverty and low economic status. Overcrowding in the household and pollution are major risk factors.[17] Another factor is age; *S. pyogenes* infections may be observed in persons of any age, although the prevalence of infection is higher among children (ie., 5 – 15 years).[4]

Generally, the burden of *S. pyogenes* pharyngitis and associated post-infectious complications are severe in developing countries.[5] In Ethiopia, rheumatic heart disease (RHD) is one of the causes of cardiac problems in children with a prevalence rate of 1.7%.[18] A detailed scan of literature evidenced that there is no adequate information on the prevalence, antimicrobial susceptibility profiles and associated factors of *S. pyogenes* in the country. The treatment of pharyngitis caused by this bacterium is empirical, based on clinical judgment, an approach that may predispose to the emergence of drug resistance. Pharyngeal infections might be recurrent and prolonged which may increase the risk of post-streptococcal complications. The present study aimed to assess the prevalence and antimicrobial susceptibility profiles of GAS among school-aged children suspected of pharyngitis, at three government health institutions in Arba Minch, southern Ethiopia.

Materials and Methods

Study design, Area and Period

A facility based cross-sectional study was conducted at three government health institutions in Arba Minch town (Arba Minch General Hospital, Sikella and Shecha Health Centers) in 170 school-aged children suspected of pharyngitis during 1st March, to 31st August, 2019. Arba Minch town is the capital of Gamo Gofa Zone which is located 505 km south of Addis Ababa. The total population of the town as per Central Statistical Agency census report was 74,879, of whom 39,208 were men and 35,671 were women.[19] Arba Minch General Hospital serves more than 1.5 million individuals by providing preventive, curative and rehabilitative care in out-patients, in-patients, pharmacy, and laboratory departments. Health centres provide preventive and curative service in out-patient, pharmacy and laboratory departments for approximately 50,000 inhabitants of the town. Children who were taking or who already received antibiotics within the previous one week of their visit to the above mentioned health institutions were excluded from the study. Ethical clearance was obtained from the Institutional Research Ethics Review Board of the College Medicine and Health Science of Arba Minch University (Ref. No. CMHS/10635/21).

Sample Size determination and Sampling Technique

Sample Size

The sample size was determined by using a single population proportion formula. The following assumptions were considered; 11.3% prevalence, from a study done in Jimma, Ethiopia,[12] 95% confidence interval and maximum discrepancy of 5% between the sample size and the surveyed population. The initial sample size was 154 and, finally by computing a 10% (16 subjects) non response rate, the final sample size was consolidated to be 170.

Sampling Technique

A systematic random sampling technique was employed to select the study units by calculating the Kth value, where n=680, based on the average data obtained in 2018 (during six consecutive months) from Arba Minch General Hospital (440), Shecha (130) and Sikella (110) Health Centres. The final sample size proportionately attained for each study centre was 110 (AMGH); 27 (Sikella Health Centre) and 33 (Shecha Health Centre). The Kth values were determined accordingly, ie., ~4 for each study centre. Based on this K^{th} value (ie., 4th), the study participants were selected. The first participant was the 2nd child who

came to the facility during the study period and was selected by a lottery method.

Data collection and laboratory investigation

Data Collection

Upon the admission of each participant, a written assent was obtained. All study participants were examined by trained health officers or physicians. Pretested semi-structured questionnaire was used to collect the socio-demographic and clinical data through a face-to-face interview.

Collection, Isolation and Identification of S. pyogenes

The posterior pharynx and tonsils were swabbed by a trained physician/health officer with a sterile cotton swab; the swabs were placed in to thioglycolate broth and transported immediately to the Microbiology and Parasitology Laboratory, Department of Medical Laboratory Sciences, College of Medicine and Health Sciences. The specimens were inoculated onto 5% sheep blood agar and incubated at 37° C aerobically in presence of 5-10% CO_2 for 48 hours. Culture plates negative for beta-hemolytic colonies were incubated further for 24 hours to allow the slow growers to flourish. Identification of GAS isolates was done based on the beta-hemolytic activity on 5% sheep blood agar, colony characteristics (small, pinpoint, circular and semi-transparent), Gram staining, catalase test, bacitracin susceptibility (using 0.04-U disk, Abtek, England) and hydrolysis of pyrrolidonyl aminopeptidase (Hardy Diagnostics, USA) tests (20).

Antimicrobial susceptibility testing

Antibiotic susceptibility test was carried out on Mueller Hinton blood agar by Kirby-Bauer disk diffusion method according to the Clinical Laboratory Standards Institute (CLSI), 2018 guidelines. Totally eight antibiotic disks (Abtek, England), such as penicillin G (10U), amoxicillin (10µg), vancomycin (30µg), ceftriaxone (30µg), chloramphenicol (30µg), erythromycin (15µg), tetracycline (30µg) and clindamycin (10µg) were used with their respective concentrations. After incubating at 37° C for 24 hours in a candle jar, the diameters of zones of inhibition were measured and interpreted as susceptible, intermediate, or resistant as per the recommendation of CLSI, 2018 guidelines.[21] The D test was performed for the erythromycin-resistant and clindamycin-susceptible isolates. Disc diffusion D-zone assays were performed using erythromycin and clindamycin disks, placed at an edge-to-edge distance of 20 mm apart on Mueller Hinton Sheep blood agar plates containing 5% sheep blood and incubated at 37° C in 5% CO2 for 48 h. A blunted, D-shaped clear zone around the clindamycin disk proximal to the erythromycin disk signifies a positive D test result.

Data Quality Control

In order to guarantee the data quality, 5% of the questionnaire was pretested prior to the process of main data collection. Training was given for a group of data collectors by a paediatrician to minimize inter personal variations in the identification of clinical cases. The data were checked daily for completeness, accuracy, clarity, and consistency. Incompletely filled questionnaires were discarded and standard operating procedures were strictly followed. All reagents were checked for expiry and prepared according to the manufacturer's instructions. Sterility check was performed to avoid any possible contaminations. In addition, *S. pyogenes* (ATCC 19615) and *S. agalactiae* (ATCC 13813) strains were used as quality controls. The quality of antibiotics was checked by using *Enterococcus faecalis* (ATCC 29122) and co-trimoxazole. Reference strains were obtained from Ethiopian Public Health Institute.

Statistical Analyses

Data were checked, cleaned, and coded for its completeness and entered by Epi-Data version 4.4.3.1 and exported to Statistical Package for Social Sciences (SPSS) version 25 (IBM Corporation, Armonk, NY, USA). Socio-demographic and clinical factors were described by using descriptive statistics like frequency, and percentage. Inferential statistics such as bivariable and multivariable binary logistic regression analyses were done to determine the strength of association among independent and outcome variables. Initially, the data were subjected to a series of bivariable analysis and those with a cut-off point of p-value less than 0.25 were processed further by multivariable analysis. The fitness of the model was checked by the Hosmer-Lemeshow goodness fit test. Adjusted odds ratio (AOR) and 95% confidence interval (CI) were used to determine the strength of association; p-value < 0.05 in the multivariable analysis were considered as statistically significant

Results

Socio-demographic characteristics

A total of 170 children were included; of these, 91 (53.5%) were females giving a male to female ratio of 0.87. The mean (Standard Deviation) age of the study participants was 10±2.6, with 105 (61.8%) aged between 10-15 years. Of the study participants, urban

residents and students accounts for 154 (90.6%) and 156 (91.8%) respectively. Majority of the children are from households comprising more than five members and most had a habit of sleeping in the same room with more than five other persons. The family income of 91 (53.5%) study participants were ≥ 1000 Ethiopian birr (1000 birr equivalent to 19 Euro) (Table1).

Prevalence of *S. pyogenes*

The overall prevalence of *S. pyogenes* was 15 (8.8%); in general, females and in particular who were aged between 5-9 years exhibited higher prevalence of *S. pyogenes*, ie., 12/15 (80%) and 10/15 (66.7%) respectively; the prevalence declined with increasing age. The prevalence of *S. pyogenes* among pupils was 13/15 (86.7%) while those of children from households comprising more than five members were 7/15 (46.7%) (Table 1).

Prevalence of *S. pyogenes* and clinical factors

In this study, the frequency of participants who had a history of sore throat were 45 (26.5%) and 20 (44.4%) children had recurrent episodes (at least twice) of the same in the previous six months durations, whereas 38 (84.4%) study participants received their antibiotics courses from health facilities.

Likewise, the prevalence of *S. pyogenes* among children with a history of sore throat was 9/15 (60%); of these, children who experienced recurrent episodes in the previous six months, at least twice, was 5 (55.56%) (Table 2).

Antimicrobial susceptibility profiles of *S. pyogenes*

Antimicrobial susceptibility tests were performed for all (n=15) isolates. Invariably, all isolates (ie., 100%) of *S. pyogenes* were found to be susceptible to penicillin, vancomycin, and clindamycin. However, 9 (60%) and 4 (26.7%) of those isolates were resistant to tetracycline and erythromycin respectively (Table 3). An inducible clindamycin-resistant phenotype was detected by the D-test in the case of only two isolates.

***S. pyogenes* isolates and associated factors**

Factors like age, sex, residence, schooling status, family income, occupation of parents/guardians, educational level of parents/guardians, family size in the household, number of persons sleeping in the same room (single bed), history of sore throat, frequency of recurrent sore throat, treatment measures and place of treatment were analysed by using the bivariable logistic regression to evaluate their crude association with streptococcal pharyngitis (Table 4 and 5). Those factors which meet p-value <0.05 within 95% CI after multivariable analysis were found to be age, 5-9 (AOR = 3.344, 95% CI 1.022-10.846, p-value 0.046), family income ≤500 birr (AOR = 5.146, 95% CI 1.149-23.039, p-value 0.032) and the history of sore throat in the previous six months (AOR = 5.101, 95% CI 1.569-16.588, p-value 0.007) and all these were statistically associated with *S. pyogenes* pharyngitis in children (Table 6).

Discussion

Streptococcal pharyngitis is one of the most common bacterial childhood infections and it accounts for 20-30% of pharyngitis cases in children and 5-15% of cases in adults. Antibiotic treatment of *S. pyogenesis* an effective primary prevention strategy for ARF and RHD.[22] The prevalence of *S. pyogenes* was 8.8% (95% CL; 4.7-12.9) in the present study, which is in line with findings reported in Turkey, ie., 11%,[14] Ethiopia, 11.3%[12] and Brazil, 12%.[23] On the other hand, it was higher than that reported from Nigeria, 0.6 %,[24] Iran, 2.5 %[25] and a study from India, 2.8 %.[26] These variations in the rates of prevalence can have an association with geographical region, season or the sample size chosen.

The threat of antimicrobial resistance is growing at an alarming rate worldwide and the situation is perhaps more severe in developing countries due to the gross abuse and irresponsible use of antimicrobials.[27] In this study, all isolates of *S. pyogenes* (ie., 100%) were found to be susceptible to penicillin, which is in parity with earlier studies reported from Ethiopia,[12] Tunisia,[28] Turkey,[14] and China.[29] However, it is discordant with the findings from India,[30] and Japan.[31] Moreover, 87% of isolates of *S. pyogenes* were susceptible to amoxicillin. This is in parity with a report from Tunisia.[28] In contrary, a couple of studies done in India and Saudi Arabia reported higher rates of resistance.[24,32]

The present study also showed that 26.7% of isolates were resistant to erythromycin. Resistance to erythromycin varied in studies conducted in different nations, ranging from 97.6% in China,[29] 76.6% in Nigeria[24] and 70% in Egypt,[10] to 5% in Tunisia[28] and 3.8% in Turkey.[14] However, a study performed in another city of Ethiopia report that all isolates were susceptible.[12]

In the current study, 80% of isolates of *S. pyogenes* were susceptible to clindamycin which is in parity with a study done in Jimma, Ethiopia.[12] Varying resistance to clindamycin was found in studies originating from other countries, China,[29] India,[24] Egypt[10] and Turkey[14] reporting resistance reaching 97.2, 79.4, 15.2, and 13.3 % respectively. The rate of resistance to ceftriaxone reported from Nigeria,[24] India[30] and Egypt[10]

were 82.4%, 36% and 23.3% respectively. Besides, vancomycin was 100% effective against *S. pyogenes*. This is similar to prior studies done in Egypt,[10] Ethiopia[12] and Tunisia.[28] On the other hand, a study done in Iran reported that 44% strains were resistant to vancomycin. In addition, gentamicin and chloramphenicol resistant isolates were also reported from Nigeria.[24]

An alarming finding is that 60% of isolates of *S. pyogenes* were found to be resistant to tetracycline, which is similar to the results of several studies done earlier in Ethiopia, 52.5%,[12] Egypt, 66.7%[10,24] and Tunisia, 70%.[28] However, it is lower than that reported in a study from China, 94%.[29]

The current study showed that, the age group 5-9, exhibited a statistically significant association with the prevalence of *S. pyogenes* (AOR=3.344; 95%CI=1.022-10.946; p-value 0.046) and is 3.3 times more prone to develop pharyngitis than elderly children (10-15 years). Studies conducted in Ethiopia itself[12] and India[9] theoretically state that lower age group was at higher risk. This could be correlated to their lower immunity and higher exposure to contacts which may enhance the susceptibility to *S. pyogenes*.

Similarly, monthly family income <500 birr was statistically associated with the prevalence of *S. pyogenes* (AOR=5.146; 95% CI= 1.149-23.039; p-value 0.032), which means children from low monthly income households are 5 times more likely to develop pharyngitis. Our findings are similar to the results published from Jimma, Ethiopia[12] and India,[9] where low-income group was highly prone to contract the infection. Lower standards of living conditions correspond to poor sanitation, overcrowding and imbalanced diet which result in the exposure to various infections.

History of sore throat also had a statistically significant association (AOR=5.101; 95% CI=1.569-16.580; p-value 0.007). Those children who had a history of sore throat were 5 times more likely to develop pharyngitis than their counterparts. Similarly, studies from Brazil and Ethiopia showed that participants with a history of sore throat showed higher incidence than their healthy counterparts.[12,23] This might be due to the weaker immune status of the host rendering them to become a possible carrier of *S. pyogenes* or can be attributed to an incomplete treatment.

Conclusions

The overall prevalence of GAS among school-aged children with pharyngitis was comparatively similar to another study reported in Ethiopia itself. Younger age, past history of sore throat and low socio-economic status of family were the more likely predisposing factors in developing pharyngitis. Invariably, all the isolates were highly susceptible to penicillin, clindamycin, and vancomycin. This is encouraging for clinical practitioners; but continued nationwide surveillance should be conducted periodically.

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Author's Contribution

All authors have equally contributed to the designing, data analysis, drafting or revision of the article, given final approval of the version to be published, and agreed to be accountable for all aspects of the work.

Conflicts of Interest

Authors declare that they have no conflict of interest.

Table 1 Frequency and prevalence of *S. pyogenes* with respect to socio-demographic characteristics among children with pharyngitis in Arba Minch town government health institutions, southern Ethiopia, 2019.

Variables		Frequency n(%)	Prevalence of *S. pyogenes*	
			Positive n(%)	Negative n (%)
Sex	Male	79 (46.5)	3 (3.8)	76 (96.2)
	Female	91 (53.5)	12 (13.2)	79 (86.8)
Age in years	5-9	65 (38.2)	10 (15.4)	55 (84.6)
	10-15	105 (61.8)	5 (4.8)	100 (95.2)
Residence	Urban	154 (90.6)	13 (8.6)	141 (91.4)
	Rural	16 (9.4)	2 (12.5)	14 (87.5)
Schooling status of children	Yes	156 (91.8)	13 (8.3)	143 (91.7)
	No	14 (8.2)	2 (14.3)	12 (85.7)
Educational status of father's/guardians	Illiterate	12 (7.1)	1 (8.3)	11 (91.7)
	Primary	53 (31.2)	6 (11.3)	47 (88.7)
	Secondary	54 (31.8)	4 (7.4)	50 (92.6)
	College and above	51 (30.8)	4 (7.8)	47 (92.2)
Educational status of mother's/guardians	Illiterate	21 (12.4)	2 (9.5)	19 (90.5)
	Primary	64 (37.6)	5 (7.8)	59 (92.2)
	Secondary	41 (24.1)	4 (9.8)	37 (90.2)
	College and above	44 (25.9)	4 (9.1)	40 (90.9)
Occupations of father's/guardians	Farmer	14 (8.2)	2 (14.3)	12 (85.5)
	Merchant	74 (43.5)	7 (9.5)	67 (90.5)
	Employee	58 (34.1)	4 (6.9)	54 (93.1)
	Other	24 (14.1)	2 (8.3)	22 (91.7)
Occupations of mother's/guardians	Farmer	12 (7.1)	1 (8.3)	11 (91.7)
	Merchant	39 (22.9)	3 (7.7)	36 (92.3)
	Home maker	39 (22.9)	4 (10.3)	35 (89.7)
	Employee	55 (32.4)	3 (5.5)	52 (94.5)
	Other	25 (14.7)	4 (16)	21 (84)
Family income (Ethiopian Birr)	≤500	25 (14.7)	5 (20)	20 (80)
	501-999	54 (31.8)	6 (11.1)	48 (88.9)
	≥1000	91 (53.5)	4 (4.4)	87 (95.6)
Family size	<3	10 (5.9)	3 (30)	7 (70)
	3-5	52 (30.6)	5 (9.6)	47 (90.4)
	>5	108 (63.5)	7 (6.5)	101 (93.5)
Number of person slept in a single bed room	<3	12 (7.1)	3 (25)	9 (75)
	3-5	43 (25.3)	5 (11.6)	38 (88.4)
	>5	115 (67.6)	7 (6.1)	108 (93.9)

Table 2 Frequency andprevalence of *S. pyogenes* with respect to clinical factors among children with pharyngitis in Arba Minch town government health institutions, southern Ethiopia, 2019.

Variables		Frequency n(%)	Prevalence of *S. pyogenes*	
			Positive n(%)	Negative n (%)
History of sore throat	Yes	45 (26.5)	9 (20)	36 (80)
	No	125 (73.5)	6 (4.8)	119 (95.2)
Frequency of recurrent sore throat episodes	One times	16 (35.6)	3 (18.8)	13 (81.2)
	Two times	20 (44.4)	5 (25)	15 (75)
	More than two times	9 (20)	1 (11.1)	8 (88.9)
Treatment measure	Yes	45 (26.5)	9 (20)	36 (80)
	No	0	0	0
Place of treatment measure	Health facility	38 (84.4)	7 (18.4)	31 (81.6)
	Traditional healer	7 (15.6)	2 (28.6)	5 (71.4)

Table 3 Antimicrobial susceptibility profile of S. pyogenes isolates at Arba Minch town government health institutions from March to August, 2019.

Antimicrobial agents	*S. pyogenes* isolates, (n=15) (%)		
	Susceptible	Intermediate	Resistant
Penicillin G	15 (100%)	–	–
Amoxicillin	13 (86.6%)	–	2 (13.4%)
Ceftriaxone	12 (80%)	–	3 (20%)
Chloramphenicol	8 (53.3%)	–	7 (46.7%)
Erythromycin	10 (66.6%)	1 (6.7%)	4 (26.7%)
Vancomycin	15 (100%)	–	–
Clindamycin	15 (100%)	–	–
Tetracycline	5 (33.3%)	1 (6.7%)	9 (60%)

Table 4 Bivariable and multivariable logistic regression analyses of factors associated with GAS among children with pharyngitis at Arba Minch town government health institutions, southern Ethiopia from March to August, 2019.

Variables		*S. pyogenes* prevalence rate			Bivariable and multivariable analyses (Odds ratio with 95% CI)		
		Positive	Negative	p-value	COR	p-value	AOR
Sex	Female	12	79	0.043	3.848 (1.045-14.173)	0.140	
	Male	3	76	1			
Age	5-9	10	55	0.024*	3.636 (1.183-11.176)	0.046**	3.344 (1.022-10.846)
	10-15	5	100	1			
Family income	≤500	5	20	0.018	5.437 (1.339-22.089)	0.032**	5.146 (1.149-23.039)
	501-999	6	48	0.136	2.719 (0.731-10.110)	0.103	
	≥1000	4	87	1			
Family size	>5	7	108	0.034	0.194 (0.043-0.884)	0.281	
	3-5	5	38	0.256	0.395 (0.079-1.965)	0.283	
	<3	3	9	1			
Number of person slept in a single bed room	>5	6	69	0.068	0.232 (.048-1.112)	0.072	
	3-5	6	78	0.047	0.205 (.043-0.981)	0.063	
	<3	3	8	1			
Sore throat episode	Yes	9	36	0.004	4.958 (1.653-14.869)	0.007**	5.101 (1.569-16.588)
	No	6	119	1			

**Statistically significant at p < 0.25 in bivariable analysis; **Statistically significant at p < 0.05 in multivariable analysis, AOR: Adjusted odds ratio, COR: Crude odds ratio, 1: reference group, CI: Confidence interval.*

Περίληψη

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**Υπεύθυνος αλληλογραφίας*

Το βακτήριο *Streptococcus pyogenes* είναι το συχνότερο αίτιο βακτηριακής φαρυγγίτιδας στα παιδιά, που μπορεί να οδηγήσει σε περαιτέρω επιπλοκές με την μορφή μεταλοιμωδών στρεπτοκοκκικών συνδρόμων. Μέχρι στιγμής, ο επιπολασμός και το προφίλ αντιμικροβιακής ευαισθησίας του *S. pyogenes* ομάδας Α μεταξύ παιδιών σχολικής ηλικίας δεν έχουν διερευνηθεί στην περιοχή Arba Minch της Ν. Αιθιοπίας. Σκοπός της παρούσας μελέτης ήταν η αξιολόγηση του επιπολασμού και της ευαισθησίας στα αντιμικροβιακά του συγκεκριμένου παθογόνου σε παιδιά σχολικής ηλικίας με υποψία φαρυγγίτιδας σε τρία δημόσια νοσοκομεία της περιοχής Arba Minch της Αιθιοπίας το διάστημα 1 Μαρτίου έως 31 Αυγούστου 2019. Οι δημογραφικοί και λοιποί σχετικοί παράγοντες συλλέχθηκαν με τη χρήση ενός προ-δοκιμασμένου, δομημένου ερωτηματολογίου. Η απομόνωση και ταυτοποίηση έγιναν με τις κλασικές, μικροβιολογικές τεχνικές, ενώ για τον έλεγχο ευαισθησίας εφαρμόστηκε η μέθοδος διάχυσης δίσκων αντιβιοτικών σε άγαρ Kirby-Bauer. Για την ανάλυση των δεδομένων χρησιμοποιήθηκε το στατιστικό πακέτο SPSS version 25. Τιμές p <0,05 θεωρήθηκαν στατιστικά σημαντικές. Συνολικά 170 παιδιά συμπεριλήφθηκαν στη μελέτη. Η πλειονότητά τους ήταν κορίτσια (91/170, 53,5%). Σε 15 παιδιά απομονώθηκε *S. pyogenes* ομάδας Α (8,8%). Όλα τα στελέχη (100%) *S. pyogenes* ομάδας Α ήταν ευαίσθητα στην πενικιλίνη, την κλινδαμυκίνη και τη βανκομυκίνη, ενώ ανησυχητική μπορεί να χαρακτηριστεί η αντοχή 60% των στελεχών στην τετρακυκλίνη. Η μικρή ηλικία (δηλαδή, 5-9 έτη) (p= 0,046), το χαμηλό μηνιαίο εισόδημα της οικογένειας (p=0,032) και το ιστορικό φαρυγγαλγίας (p=0,007) συσχετίστηκαν στατιστικά σημαντικά με την λοίμωξη από *S. pyogenes* ομάδας Α μεταξύ των παιδιών με φαρυγγίτιδα. Τα συνολικά αποτελέσματα έδειξαν ότι ο επιπολασμός του S. pyogenes ομάδας Α είναι συγκριτικά παρόμοιος με άλλες μελέτες που έγιναν στην Αιθιοπία. Όλα τα στελέχη που απομονώθηκαν παρουσίασαν ευαισθησία στην πλειονότητα των αντιβιοτικών, κάτι που είναι ενθαρρυντικό για την κλινική πράξη.

Λέξεις κλειδιά
παιδιά, φαρυγγίτιδα, Streptococcus pyogenes, ευαισθησία στα αντιβιοτικά

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