

Research Article

Prevalence and Risk Factors for Trachoma among Primary School Children in Bajjil District, Al Hudaydah, Western Yemen

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Abstract

Background: Trachoma, a neglected tropical disease, is the world's leading infectious cause of blindness. Trachoma is the disease of poverty that affects over one billion of the world's poorest people.

Objectives: The aim of this study was to determine Trachoma prevalence and risk factors among primary school children in Bajjil area, Al Hudaydah, Yemen.

Methods: A cross-sectional study was performed on 1052 schoolchildren aged 7 years - 12 years in Bajjil district of Al Hudaydah governorate, Yemen. They numbered 600 (57%) males and 452 (43%) females from 6 randomly selected public schools. Child's eye examination was done by trained 6 year medical school students, according to WHO grading system for trachoma. Data on risk factors and health characteristics of a child were collected using a structured questionnaire.

Results: The gender distribution of study participants was male 57% and female was 43%. Slightly majority of the study participants were in age group 10 to 12 (56.2%). The results of independent associated odds ratio analysis revealed that risk factors of contracting Trachoma are: 7-9 years children (OR=2.1, p=0.002), <2 time frequency of face washing per day (OR=1.8, p=0.003), flies in the face and/or unclean child face (OR=1.9, 95%, p=0.001), No education of the father (OR=1.5, p=0.03), No education of the mother (OR=1.7, p=0.01), Absent of the water for face and body wash (OR=3.1, p<0.0001), Absent of latrine in the house of child (OR=1.8, p=0.007), Family size 4-6 and >6 members (OR=1.8, p=0.002; and OR=2, p<0.0001, respectively).

Conclusion: We identify area where, at the time of the survey, trachoma was a public health problem as defined by WHO. The implementation of the WHO-approved SAFE strategy for effective prevention and control of trachoma was recommended in the study area due to the prevalence of active trachoma, being 10.9% above the WHO-recommended thresholds (prevalence >10%).

Keywords: Prevalence; Risk factors; Trachoma; School children; Bajjil district; Al Hudaydah; Yemen

Introduction

Trachoma, a negligence tropical disease, is the principal infectious cause of blindness in the world [1,2]. Conjunctival infection is caused by *Chlamydia trachomatis*. The infection is spread through personal contact (by hands, clothing, or bedding) and flies that come into contact with secretions from the eyes or nose of an infected person. Trachoma is a disease of poverty that afflicts more than a billion of the world's poorest people [3,4]. It affects 37 countries in Africa, Asia, Central and South America, Australia and the Middle East including Yemen [5,6], with eighteen million cases of active trachoma (85% of all cases globally) and 3.2 million cases of trichiasis (44% of all cases

worldwide) exist in 29 out of 47 countries in the African and Middle Eastern region of the World Health Organization (WHOs).

As indicated by the World Health Organization's Weekly Epidemiological Record, it is estimated that trachoma is responsible for the visual impairment of about 1.9 million people, of who 1.2 million are irreversible blind. About 158 million people worldwide lived in areas endemic with trachoma and were at risk of developing trachoma blindness [7]. The problem of trachoma on involved individuals and communities is massive. As maintained by WHO fact sheets, the economic cost in terms of lost productivity from blindness and low vision is estimated to be US \$ 2.9 to US \$ 5.3 billion annually, increasing to US \$ 8 billion when trichiasis is included [7]. Whilst children are nearly all susceptible to infection, the blinding effects of repeated infections do not usually develop into adulthood. Women are four times more likely to get trichiasis than men, partly owing to repetitive exposure to infections in their children. The crippling effects of vision loss complicate other common challenges that the poor and the marginalized face [7]. The World Health Organization (WHO) established the Global Alliance to Eliminate Trachoma by the Year 2020 (GET-2020) in 1997 and was endorsed by the World Health Assembly (WHA) in 1998 through World Health Assembly Resolution 51:11 with the object of coordinating and provided that technical and logistical support for Member States in the process of implementing the SAFE strategy (surgery, antibiotics, facial hygiene, environmental improvement) [8]. It has been stated that the goal of the GET 2020

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Alliance is to achieve the global elimination of blinding trachoma as a public health problem by mobilizing resources in cooperation with a global partnership of member states, NGOs and the private sector.

No studies have been conducted in Bajjil on trachoma before. However, there are a limited number of studies on the prevalence and determinants of eye infection in general and trachoma in specific [9-12] and trachoma. Recently Thabit et al. [12] conducted a cluster survey in all 42 assessment units comprising 166 rural areas from nine governorates (Al Dhalea, Al Hudaydah, Al Jawf, Hadramout, Hajjah, Ibb, Lahj, Marib, Taiz) using the systems and methodologies of the Global Trachoma Mapping Project. The prevalence of TF among children aged 1 year to 9 years was 10% in 7 districts and 9% in 24 districts. The prevalence of trichiasis in adults older 15 years of age was 0.2% in 19 districts. Being older (within the age group of 1 to 9 years), being a male, living in a household with more children, and living in a household that reported the use of open defecation were each independently associated with higher odds of developing Trachoma infection [12]. Therefore, the aim of this study was to determine the prevalence and risk factors of active trachoma among primary school children living in Bajjil, Al Hudaydah, and western Yemen.

Subjects and Methods

Study design and study population

A cross-sectional study was performed on 1052 schoolchildren aged 7 years to 12 years in Bajjil districts of Al Hudaydah governorate, Yemen in April 2020.

Study variables

The response variable of this study was presence of sign of active trachoma (TF/TI) in either eyes of the child which can be recorded as follows: The independent variables or the risk factors of this study were: sex of the child, age of the child, frequency of face washing per day, using soap when washing face, face cleanness, presence of flies on child's face, education level of father and mother of the child, family size, availability of water in the household, latrine availability and keeping animals in living house.

Clinical child's eye examination

Child's eye examination was done by trained 6 year medical school students, according to WHO grading system for trachoma (Figure 1).

Results

The gender distribution of study participants was male 57% and female was 43%. Slightly majority of the study participants were in age group 10 to 12 (56.2%). About 60.9% of children washed their face at least two times per day. Only 20.2% of the children used soap to wash their face and 579 (55%) of the children had clean face during the interview. There were flies on the face of 17.7% of children during interview. Most of the fathers (44%) had primary education and only 10.6% of mothers had primary education.

Majority of the family of the child had family size of >6 (41.8%). Only 33.1% children always had water in their houses while 8.4% does not have at all water in their houses. About 80% of children's family had latrine and 16.4% had no latrine in the house.

The results of independent associated odds ratio analysis revealed that risk factors of contracting Trachoma are: 7 years to 9 years children (OR=2.1, 95%CI=1.4-3, p=0.002), <2 time frequency of face washing per day (OR=1.8, 95%CI=1.2-3, p=0.003), Unclean child face (OR=1.9, 95%CI=1.3-2.8, p=0.001), No education of the father

(OR=1.5, 95%CI=1.03-2.2, p=0.03), No education of the mother (OR=1.7, 95%CI=1.1-2.7, p=0.01), Absent of the water for face and body wash (OR=3.1, 95%CI=1.8-5.2, p<0.0001), Absent of latrine in the house of child (OR=1.8, 95%CI=1.2-2.9, p=0.007), Family size 4 to 6 and >6 members family (OR=1.8, 95%CI=1.2-2.7, p=0.002 and OR=2, 95%CI=1.3-2.99, p<0.0001, respectively) (Table 1).

Table 1: The background characteristics of 1052 school children participate in the trachoma study in 2018.

Variables	Number	Percentage
Sex		
Male	600	57
Female	452	43
Age groups		
7 years - 9 years	461	43.8
10 years - 12 years	591	56.2
Frequency of face washing		
<2	411	39
≥ 2	641	60.9
Washing face with soap		
Yes	212	20.2
No	840	79.8
Face conditions (*No nasal or eye discharge)		
Clean*	579	55
Unclean	473	45
Present of flies on face during investigation		
Clean*	579	55
Unclean	473	45
Education level of Father		
No education	411	39
Primary school	462	44
Secondary above	179	17
Education level of mother		
No education	711	67.6
Primary school	112	10.6
Secondary above	229	21.8
Availability of water in the living house for face and body wash use		
Always	348	33.1
Often	421	40
Rarely	195	18.5
Absent	88	8.4
Latrine availability in the house		
Yes	879	83.6
No	173	16.4
Keeping animals in living house		
Yes	476	45.2
No	576	54.8
Family size		
<4	336	31.9
6-Apr	278	26.4
>6	440	41.8

Discussion

The aim of this study was to determine the prevalence and risk factors of active trachoma among primary school children aged 7 years to 12 years living in Bajjil District, Al Hudaydah, and Yemen. The prevalence of active Trachoma (TF) was 10.93% in this study, which is slightly higher compared to other studies conducted previously in Yemen [10-12]. The result of this study showed that children aged 7 years to 9 years (OR=2.1, 95% CI=1.4-3, p= 0.002) were significantly associated with active trachoma (OR=2.1, 95% CI=1.4-3, P=0.002). This result is similar to that found in several other studies, [13-16] as there is usually a TF burden in pre-school children - the age group that appears to harbor the largest portion of the ocular *C. trachomatis* reservoir in environments in which this has been studied in detail [17,18]. The shift in the burden of trachoma to higher age groups has been observed in regions where the prevalence of trachoma is

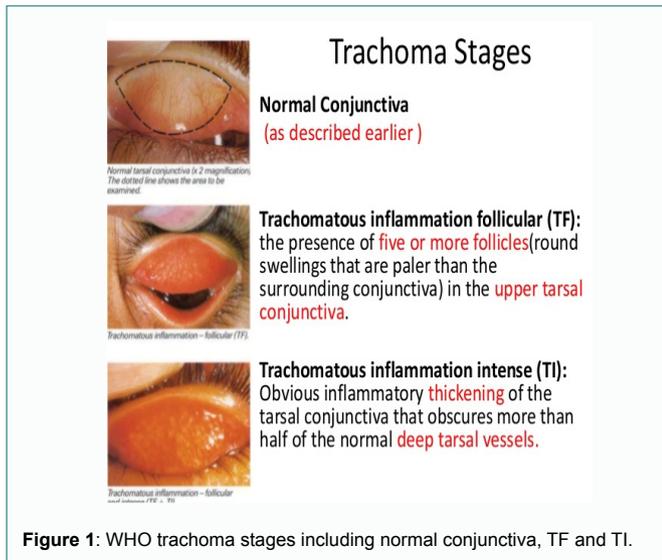


Figure 1: WHO trachoma stages including normal conjunctiva, TF and TI.

generally lower, presumably because transmission intensity (and age of first exposure) is lower in these regions. However, it has been suggested that clinical signs of active trachoma and *C. trachomatis* infection are decoupled at lower prevalence rates [19]. The result of this study showed that the frequency of daily face washing was significantly associated with active trachoma (less than twice the frequency of face washing per day; OR=1.8, 95% CI= .2-3, p=0.003). Children who washed their faces at least twice a day were less likely to develop an active trachoma infection. This is due to the fact that with the increase in the number of face washing, the cleanliness of the child's face improves. This reduces the chance that the child will develop trachoma. The result was consistent with other studies [20,21]. In addition, the previous finding was consistent with our finding in facial conditions in which an unclean child's face was significantly associated with active trachoma (OR = 1.9, 95% CI=1.3-2.8, p=0.001).

The presence of flies on the face of children was another important risk factor for developing active trachoma in this study (OR=1.9, 95% CI=1.3-2.8, p=0.001). Children who had no flies on their faces were less likely to have trachoma than children with flies on their faces. This is due to the fact that flies act as a propagating agent for trachoma, transferring *C. trachomatis* from the eyes of infected children to the eyes of uninfected children. This result was consistent with previous studies [9,12,22-27] which showed that the presence of flies on the face increased the chance of a child developing trachoma.

In our data, reported absent of latrine in the house of child (open defecation) was associated with higher odds of active trachoma in children (OR=1.8, 95%CI=1.2-2.9, p=0.007), as also seen in previous studies [13,14]. This is thought to relate to the fact that eye-seeking *Musca* sp. flies lay their eggs on surface-exposed human feces [28,29]. It has been suggested that provision of improved latrines could reduce the fecundity of these flies [28] and thereby limit transmission of ocular *C. trachomatis* infection in areas where flies are an important vector. However, the extent to which latrine use directly influences force of infection is unclear, insofar as latrine use could also represent a surrogate for other health-influencing parameters, such as education or economic opportunity.

This disease persists in many parts of the developing world, particularly in communities without adequate access to water and sanitation [30]. This study revealed that children of availability of

water in their house absent were 3.1 times (OR=3.1, 95%CI=1.8-5.2, p<0.0001) more likely to be infected by active trachoma compared to children of house with always availability of water in their compound. This might be due to the importance of water for facial cleanliness and for hygiene. One of the components of SAFE strategy is facial cleanliness. To implement this strategy, availability of water is crucial to reduce the transmission of trachoma. This result was in line with other studies [9,20,31,32]. Large family size (4-6 and > 6 persons in the household) with a higher risk of developing active trachoma compared to children of small family size (OR=1.8, 95%CI=1.2-2.7, p=0.002 and OR=2, 95 CI=1.3-2.99%, p<0.0001 respectively) (Table 2). This result was archived with other studies [9,20,31,32]. This result can be explained by the fact that large family size can represent a proxy for other criteria affecting health, such as education or economic opportunity.

Table 2: Factors associated with trachoma among primary school children participate in the trachoma study in 2018.

Variables	Positive Trachoma		OR	95%CI	χ ²	p
	No	%				
Sex						
Male n=600	75	12.5	1.4	0.98-2.2	3.5	0.06
Female n=452	40	8.8	0.6	0.4-1	3.5	0.06
Crude rate	115	10.93				
Age groups						
7-9 years n=461	69	14.9	2.1	1.4-3	14	0.002
10-12 years n=591	46	7.8	0.5	0.32-0.7	14	0.002
Frequency of face washing						
<2 n=411	59	14.4	1.8	1.2-2.6	8.6	0.003
≥ 2 n=641	56	8.7	0.6	0.3-0.8	8.1	0.004
Washing face with soap						
Yes n=212	19	9	0.8	0.4-1.2	1	0.3
No n=840	96	11.4	1.3	0.7-2.1	1	0.3
Face conditions (*No nasal or eye discharge)						
Clean*n=579	47	8.1	0.5	0.3-0.78	10	0.001
Unclean n=473	68	14.4	1.9	1.3-2.8	10	0.001
Flies in the face of child						
Yes n=579	47	8.1	0.5	0.3-0.78	10	0.001
No n=473	68	14.4	1.9	1.3-2.8	10	0.001
Education level of Father						
No education n=411	56	13.6	1.5	1.03-2.2	4.5	0.03
Primary school n=462	46	9.9	0.8	0.5-1.2	0.8	0.36
Secondary above n=179	13	7.2	0.8	0.44-1.3	0.8	0.3
Education level of mother						
No education n=711	89	12.5	1.7	1.1-2.7	5.7	0.01
Primary school n=112	11	9.8	0.8	0.4-1.6	0.2	0.69
Secondary above n=229	15	6.5	0.5	0.2-0.8	5.8	0.01
Availability of water in the living house for face and body wash use						
Always n=348	11	3.2	0.2	0.09-0.3	32	<0.0001
Often n=421	36	8.6	0.7	0.4-1.1	2.2	0.1
Rarely n=195	31	15.9	1.7	1.1-2.7	6.1	0.01
Absent n=88	22	25	3.1	1.8-5.2	20	<0.0001
Latrine availability in the house						
Yes n=879	86	9.8	0.5	0.3-0.8	7.2	0.007
No n=173	29	16.8	1.8	1.2-2.9	7.2	0.007
Keeping animals in living house						
Yes n=476	61	12.8	1.4	0.9-2.1	3.1	0.07
No n=576	54	9.4	0.7	0.4-1.0	3.1	0.07
Family size						
<4 n=33	4	12.1	1.1	0.3-3.2	0	0.82
4-6 n=278	44	15.8	1.8	1.2-2.7	9.3	0.002
>6 n=440	67	15.2	2	1.3-2.99	13	<0.0001

The catastrophic consequences of the war, which include loss of infrastructure, widespread famine, and large-scale internal displacement, [33,34] may make our data only of historical interest, as it may take some time before local health services can again prioritize disposal of trachoma [35], meanwhile, the Bajill children surveyed were likely to have both quantitatively and qualitatively changed. We very much hope for a speedy end to the current conflict. As of 2018, Cambodia, Ghana, Iran, Laos, Mexico, Nepal, Morocco and Oman have been certified as having eliminated trachoma as a public health problem; However, Yemen appears to be on the reverse path in 2020 [36].

Conclusion

The results of this study showed that risk factors: frequent daily face washing, presence of flies on the child's face during the interview, and absence of water in the home were significantly associated with trachoma. Therefore, the study recommends that any authorities concerned with the prevention and control of trachoma among primary school children living in the Bajill area should pay special attention to these factors. The implementation of the WHO-approved SAFE strategy for effective prevention and control of trachoma was recommended in the study area due to the prevalence of active trachoma, being 10.9% above the WHO-recommended thresholds (prevalence > 10%).

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Conflict of Interest

"No conflict of interest associated with this work".

Author's Contribution

This research work is part of the National Center for Public Health Laboratories (NCPHL) project. The first author trained the survey team and supervising the clinical works and the second and third authors reviewing and editing the research.

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