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Prevalence and Risk Factors of Active Trachoma among Children in Gondar Zuria District North Gondar, Ethiopia

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Abstract

The aim of this study was to investigate prevalence and potential risk factors of active trachoma in Gondar zuria district.

Methods: Community-based cross-sectional study was conducted in Gondar Zuria District from December 1 to December 30, 2014. Multi stage random cluster-sampling technique was employed and all children 1-9 years old from selected household were clinically assessed for trachoma based on simplified WHO 1983 classification. A total of 597 children were included in this study. Data were collected by using semi-structured interview, pre-tested questionnaire and observation. EpiInfo 3.5.3 was used for data entry and cleaning, while IBM SPSS Statistics 20 was used for data analysis. A P-value <0.05 was considered statistically significant throughout this study.

Result: The overall prevalence of active trachoma in this study was found to be 12.1%. The risk factors identified were age 1-5 years, low monthly income, poor perceived economy, infrequent face washing habit, not using soap during washing, absence of clean face, not using latrine, absence of waste disposal, and higher house hold fly density. On the other hand going to school was the only preventive factor identified in this study.

Conclusion: The study result has shown the magnitude of active trachoma dropped from 76.5% to 12.1%, by 8 folds. This is dramatic decrement taking in to consideration the very large magnitude of the problem as of the base line data. WHO has leveled a cut of point for active trachoma to decide it is or not major public health problem. Based on this criterion, active trachoma is still a public health problem in the study woreda. So the woreda community at large and other responsible bodies should integrate each other to mobilize AFE strategy interventions by large.

Keywords: Active trachoma; Prevalence; Risk factor; Children; Ethiopia

Introduction

Trachoma is an eye disease caused by ocular infection with Chlamydia trachomatis, which can result in blindness after cycles of repeated infections. It is the leading infectious cause of blindness worldwide. According to 2005-6 NBLT [1,2] Survey in Ethiopia trachoma was the third major cause of low vision and the second cause of blindness at national level and active trachoma prevalence was highest at ANRS with 62.5 %, [3,4]. Trachoma is responsible for 5.9 million cases of blindness and the disability caused by blindness leads individual dependency upon others for care and impedes the economic development of whole nations [5].

Trachoma is still considered a leading cause of preventable blindness in sub-Saharan Africa especially in countries that have poor environmental sanitation, inadequate water supply and poor socio-economic status like Ethiopia [6,7].

The national survey (2007) of Ethiopia showed a prevalence of 40.1% active trachoma among children aged 1-9 years [7]. Amhara region had the highest prevalence of active trachoma among children aged 1-9 years (62.6%) [8]. The high burden of trachoma in the Amhara region calls for collecting a further District-specific data and comprehensive efforts to evaluate the risk factors of trachoma for designing and expanding effective intervention programs even if only limited studies were conducted previously.

According to 2003 Lions-Carter Center sight first initiative base line survey result at Gondar zuria woreda the prevalence of active trachoma (TF) in children 1-9 year was 76.5% and percent of children with clean face was 35.4.% [9].

Although trachomatous blindness is untreatable, it is eminently possible to prevent and the World Health Organization promotes the use of the SAFE strategy. Surgery, addresses the needs of people at imminent risk of blindness. Antibiotics particularly Zithromax is used against active disease by treating infection in individuals and suppressing

transmission in the community or to eliminate an individual's C. trachomatis infection. Face Washing, breaks the cycle of reinfection and prevents transmission of disease, especially among children. Environmental Improvement, used to reduce the risk of infection/re infection. Behavioral change and environmental improvements are cornerstones of prevention efforts [1,6].

Trachoma is endemic in 48 countries mostly in Africa and the Middle East, although a few countries in the Americas and Asia are also affected. Approximately 84 million people are affected by active trachoma. More than 10 million people are at immediate risk for blindness from trichiasis. Although trachoma is easily preventable, the disease already has blinded more than 7 million people [10].

The WHO identified a simplified grading system with five stages in the development of trachoma. The key trachoma indicator stages are Trachomatous Inflammation-follicular (TF) and Trachomatous Trichiasis (TT) [1,10].

The Carter Center Ethiopia and the woreda have involved in implementing SAFE strategy to control trachoma at Gondar zuria woreda since 2004. Zithromax mass treatment had given several times in annual basis for all kebeles population [9].

Evaluation result of three years SAFE strategy for trachoma control in five districts of Ethiopia show the prevalence of TF was reduced minimum by 32% to 88% maximum, and clean face increased by 31% [11].

Another study done on impact of SAFE strategy interventions on trachoma prevalence in Rural Ethiopia show the community summarized mean prevalence for TF was 34.0% (SD=18.7). Odds of active trachoma were lower in children aged 6-9 years than in younger children (OR 0.47, 95% CI: 0.23-0.96) and higher for children with ocular discharge (OR 4.5, 95% CI: 2.6-7.7) or flies on their eyes OR 2.5, 95% CI: (1.6-3.7); and in children who received 2 or 3 doses lower than received 1 dose (OR 0.26, 95% CI: 0.08-0.88) [10,12].

With this context, this study was designed to determine the prevalence of trachoma and associated risk factors in the study area. On top of this identified risky factors in the study area have paramount importance for the improvement of programs aimed at trachoma prevention and control in the area perhaps in the region.

Methods

Study design

Community based cross-sectional study was carried out in Gonder zuria district, north Gondar, Amhara regional state, Ethiopia from December 1 to December 30, 2014. Gondar zuria district is one of the 23 woredas in North Gondar an altitude of 1800-2700 meters above sea level. The city is located 750 km Northwest of Addis Ababa. The area has two agro climatic divisions with altitudes of 1500-2500 meters, and >2500 meters above sea level. According to FDRE CSA 2011 report, the total population of the woreda was 191,351 [13]. Of this 51% of the populations were living in the altitudes of 1500-2500 meters and the rest in the altitude of >2500 meters above sea level [14]. The number of children aged 1-9 years was about 19,101 [15]. The source populations of the study were all children with the age of 1-9 years living in Gondar Zuria district.

Sampling methods

The sample size was determined using single population proportion formula by taking margin of error 5% confidence level 95% and prevalence 62% from the Amhara regional prevalence [11] conducted in Amhara regional state Ethiopia. Using 1.5 design effect and 10% non response rate the final sample size required for the study was 597. We employed cluster sampling technique to select the study participants. Children and house hold in Gondar Zuria district during the study period and fulfilling the inclusion criteria were recruited until the allotted sample size was achieved.

Study variables

Dependent variable: Presence of active trachoma.

Independent variables: Sex, age, education, occupation, family size, income, and animals shelter.

Access, source, and amount of water, face washing habits, and latrine utilization, altitude, and crowd living.

Operational definitions

Active trachoma: Trachomatous inflammation, follicles or Trachomatous inflammation intense.

TF: When there were five or more follicles of >0.5 mm in the conjunctiva of either eye.

Clean face: A child who did not have an eye discharge or nasal discharge and fly in the face at time of observation.

Perceived economy: Individuals thought about their economy in relative to their neighbors.

Face washing habits: Frequency of washing children's faces was determined by asking the mother or caregivers the number of times children's faces were washed in a day and categorized as not washed, washed once, washed two, and three or more times daily.

Access to water: The person responsible for water collection reported on how long it took for a return journey to collect water from the main water source, including time spent in the queue. Water accessibility was analyzed in two categories: 30 minutes, and >30 minutes.

Pit latrine: Each household head was asked if there was a latrine in the household. The presence and usage of a latrine were confirmed by visual inspection.

Fly density: In the previous studies household-fly density was determined by examining the presence of flies on children's faces and around the doorways for about half a

minute. Fly density was graded as (1-3 flies), (4-7 flies), and (>7 flies) [16].

Cattle ownership and shelter: The household head was asked if the family owned cattle and have an appropriate animal's shelter.

Low land: An area between 1500 and 2000 meters above sea level [17].

High land: An area greater than 2500 meters above sea level [17].

Data Collection

Measurements

Each child had examination of both eyes. Two ophthalmic nurses who had participated in national trachoma survey as eye examiner took part in the examination of the eye. The examination of the eye of each study participant was done by careful inspection of eye lashes, cornea, limbus, eversion of the upper lid and inspection of the tarsal conjunctiva by the help of magnifying binocular lenses (x2.5) and penlight torches. The guide used for reporting examination results with the simplified trachoma grading scheme was developed by WHO [18]. Both eyes were examined in the same sequence using a magnification convergent 2.5x binocular loupe adjustable to pupillary distance of the observer. Hygienic measures were also taken and results of the examination were registered.

Structured interviews with heads of household and observations were used to measure individual and household risk factors trained health workers prior to the eye examination conducted a structured interview with the mother/caretaker of the child using a pretested questionnaire. Data were collected for each index child including age, sex, household characteristics, face washing habits, access source and amount of water, latrine utilization, altitude, and trachoma status. The steps of eye examination and trachoma grading strictly followed the WHO's simplified grading scheme [19,20] by a single examiner. Two ophthalmic nurses, two trained community health workers, and one supervisor were recruited to collect the data after they received two days training.

Data management and analysis

All responses to the survey questionnaires were coded against the original English version and data entering, and initial cleaning were performed by Epi Info 3.5.3 and then the data were transferred to IBM SPSS Statistics 20 for analysis. Further data cleaning and frequency run was performed to check for accuracy, outliers, inconsistencies, and missed values.

The bivariate analysis was conducted for each 25 potentially explanatory variables. Multivariate analyses were performed including those factors that significantly influenced the risk of trachoma in the bivariate analyses.

Among the 25 variables tested in the bivariate analysis only 15 variables associated with active trachoma were further assessed to identify which variables independently associated with the outcome variable. Model fitness was assessed using the Hosmer-Lemeshow goodness-of-fit test and our model fits pretty well: χ^2=61.3 P-value 0.71. A P-value ≤0.05 was declared statistically significant.

Ethical consideration

The person in charge of each district and kebele leaders were informed and their agreement received before the onset of data collection. Moreover, all the study participants were informed about the purpose of the study, their right to refuse and assurance of confidentiality. Then, informed verbal consent was obtained from each study participant. Strict confidentiality was maintained through anonymous recording and coding of the questionnaire.

Result

Socio demographic characteristics

A total of 586 children in Gondar Zuria district out of the planned 597 children for the district were enumerated, giving an overall response rate of 98.1%. Among these participants 48.6% (285) were males and 51.4% (301) were females.

The proportion of children of aged 1-4 years was higher than the proportion of aged 5-9 years. The mean age of children was 5.1 years with a standard deviation of ±2.5. The median age was 5 years with the most frequent age of 3 year.

Regarding educational level of the participants (58.7%) children were from illiterate household heads, (21.2%) were from primary level attained household heads, and the rest (20.2%) children were from secondary level attained household heads.

The mean family size of household in the district was 5.4 with standard deviation of ± 1.6. The median family size was 5 with the most frequent family size of 5. The minimum and maximum family size was 3 and 10 respectively.

The mean number of children less than 10 years old in a given household was 2.3 with standard deviation of ±1

The majority of respondents (83.4%) were from family who had owned animals. Household respondents were asked how they perceived their economy relative to their neighbours 204 (34.8%) children were living in families who perceived as very

poor or poor, 317 (54.1%) as average, and 65 (11.1%) perceived as rich (Table 1).

Table 1: Socio demographic characteristics of study units at Gondar Zuria district, north Gondar, Ethiopia, December 2014.

Factors	Frequency (N=586)	Percentage (%)
Age of children		
1-5 Years	332	56.6
6-9 Years	254	43.4
Sex of children		
Female	301	51.4
Male	285	48.6
Currently enrolled at school		
Yes	336	57.3
No	250	42.7
Education of HH heads		
Illiterate	344	58.7
Primary	124	21.2
Secondary	118	20.1
Family size of HH		
3-5 member	272	46.4
6- 10 member	314	53.6
No of living rooms of HH		
1-2 rooms	415	70.8
3-5 rooms	171	29.2
Presence of trachoma symptom in other family member		
Yes	294	50.2
No	292	49.8
Average monthly income		
<1000	185	31.6
1000-2000	250	42.7
>2000	151	25.8
Perceived HH economy		
Poor	204	34.8
Average	317	54.1
Rich	65	11.1
HH own animals		
Yes	489	83.4
No	97	16.6

Water, face washing, and other environmental factor

The majority of children 451 (76.9%) were from households having water access within 30 minutes or less on foot travel distance and the rest with more than half an hour. Only 67 (11.4%) of children were living households who consumed 25 liters water per day the remaining 330 (56.3%), 140 (23.9%), and 49 (8.4%) children were living with households who consume 50 liters, 75 liters and 100 or more liters of water per day respectively.

Among participants only 12.2% never washed their faces, and the majority 34.6% washed once a day and only 17.6% washed three times a day. Regarding house hold face washing habit almost more than half of the households wash their face at least once a day. Similarly 68.8% of the children involved in this study had clean face. Furthermore among 586 children participated in this study 46.4% of them had household pit latrines.

From all participants of this study 29% children were living with households who kept domestic animals inside the house together with people and the remaining kept animal in separate structures. Concerning the climatic zones of the respondents 49.8%)were living above 2,500 meters of sea level and 50.2% were between 1, 500 to 2,500 meters above sea level (Table 2).

Table 2: Association of active trachoma and risk factors among children of age 1-9 years obtained through univariate and multivariate logistical regression in Gondar Zuria district, north Gondar, Ethiopia, December 2014.

Trachoma inflammation Follicles					
Factors	**Yes (%)**	**No (%)**	**COR (95% CI)**	**AOR (95% CI)**	**p-value adjusted**
Age of children					
1-5 Years	51	281	2.12(1.23, 3.66)	2.81(1.22, 5.66)	0.0062
6-9 Years	20	234	1	1	
Sex of children					
Female	36	265	1.37(1.01, 3.68)	1.78 (0.79, 3.67)	0.0874
Male	35	250	1		
Currently enrolled at school					
Yes	30	306	0.49(0.29, 0.88)	0.41(0.23, 0.86)	0.0058
No	41	209	1	1	
Education of HH heads					
Illiterate	51	293	1	1	
Primary	12	112	0.64 (0.24, 1.26)	0.60 (0.25, 1.44)	0.21
Secondary	8	110	0.44 (0.19, 097)	0.58 (.0.39, 1.33)	0.14
Presence of trachoma symptom in other family member					
Yes	43	251	1.62 (1.04, 3.41)	1.77(0.95, 4.31)	0.0643
No	28	264	1	1	
Average monthly income					
<1000	35	150	2.70(1.83, 7.79)	2.41 (1.08, 6.69)	0.031
1000-2000	24	226	1.23 (0. 91, 4.23)	1.19 (.087, 5.13)	0.078
>2000	12	139	1	1	
Perceived HH economy					
Poor	34	170	4.13(1.23, 13.94)	3.91 (1.87, 13.40)	0.029
Average	34	283	2.48(0.96, 8..34)	2.31(0.68, 7.79)	0.0581
Rich	3	62	1	1	
Daily average water consumption					
< 25 litter	12	55	2.50(1.45, 7.54)	†	

25-50 litter	41	289	1.59(1.03, 5.12)		
50-75 litter	14	126	1.40(0.97, 3.76)		
75-100 litter	4	45	1		
Face washing habit					
None	29	64	9.40 (3.99, 18.21)	5.96 (2.87, 16.01)	0.0003
Once a day	22	191	2.38 (1.02, 5.79)	2.01 (1.09, 10.07)	0.0453
Two times a day	16	177	1.87 (0.94, 5.56)	1.44 (0.89, 5.19)	0.0577
Three or more times a day	4	83	1	1	
Usage of soap					
Yes	19	245	1	1	
No	52	270	2.48 (1.58, 7.45)	3.54(1.91, 10.85)	0.0051
Cleanliness of face					
Un clean face	46	162	4.01 (2.64, 13.78)	7.01(3.89, 15,17)	< 0.0001
Clean face	25	353	1	1	
HH face washing habit					
One times a day	36	257	1.92 (1.09, 4.98)	†	
Two timed a day	28	162	2.37(1.32, 7.56)		
Three times a day	7	96	1		
Pit latrine					
Yes	18	257	1	1	
No	53	258	2.93 (1.75, 8.97)	2.05(1.34, 7.55)	0.0068
Presence of waste disposal					
Yes	18	290	1	1	
No	53	225	3.80(1.79, 11.77)	3.09(1.53, 11.12)	0.0023
HH fly density					
3-Jan	11	162	1	1	
7-Apr	29	180	2.37 (1.71, 8.97)	3.98(2.01, 10.72)	0.0002
>7	31	173	2.64 (1.79, 9.04)	4.22(2.37, 12.95)	< 0.0001
† Dropped in the final model					

Factors associated with trachoma

The bivariate analysis in this study revealed that there were several factors as predictors of trachoma in children age 1-9 years. Among the socio demographic factors age of children, sex of children, a child who were not currently enrolled at school, lower educational level of parents, presence of trachoma in other family members, lower average monthly income, perceived poor household economy were factors associated with trachoma. For instance, children whose age range from 1-5 year(s) found to have 2.12 times more risk than children aged 6-9 years (COR=2.12, 95% CI:1.23, 3.66). Children who currently enrolled at school were less risk of having trachoma when we compare to their counterparts (COR=0.49, 95%CI: 0.29, 0.88).

Similarly factors like lower average water consumption, poor face washing habit, no use of soap during washing, unclean face, poor face washing habit of parents, not using latrine, absence of waste disposal and higher house hold fly density were risk factors identified in this study. From this factors identified in the bivariate analysis only age 1- 5 years, not enrolled at school, lower monthly income, poor perceived economy, infrequent face washing habit, not using soap, absence of clean face, not using latrine, absence of waste disposal, higher house hold fly density remained significant in the multivariate analysis

When we see the odds ratio result, a child whose parent's income <1000 birr per month were 2.41 times more risk of having trachoma when we compare to a child whose parent income >2000 birr. Similarly children who perceived poor

house hold economy had almost 4 fold increased risk of trachoma than perceived rich house hold economy (AOR=3.91, 95% CI: 1.87, 13.40). A child who enrolled at school were 2.41 times less risk of trachoma compare to a child who did not enrolled at school during the time of visit. Eventually poor face washing habit, not using soap, absence of clean face, not using latrine, absence of waste disposal, and higher hose hold fly density (AOR=5.96, 95%CI: 2.87, 16.01) (AOR=3.54, 95%CI: 1.91, 10.85), (AOR=7.01, 95% CI: 3.89,15.17), (AOR=2.05, 95% CI: 1.34, 7.55), (AOR=3.09 95% CI: 1.53, 11.12) and (AOR=4.22 95% CI: 2.37, 12.95) respectively were identified risk factors in this study (Table 2).

Discussion

This study was conducted to determine the prevalence of active trachoma infection (TF/TI) and associated risk factors among children aged 1-9 years in Gondar Zuria district, Northwest Ethiopia. The findings of this study showed that the overall prevalence of active trachoma was 12.1%. The results of this study revealed that trachoma follicular infections (TF) is still a disease of public health importance despite a marked reduction in prevalence of the disease when we compare to the previous studies conducted in other parts of the country (South Wollo, East Gojjam and Amhara regional prevalence[17,21]. However the prevalence of active trachoma in this study is almost similar with the study conducted in Malawi 13.6% [22]. The relatively lower rates of trachoma infection found in the study area compared with other parts of the country attributed to an increase in the availability of water in the study area currently compared to the previous, presence of a trachoma control programme using the SAFE strategy, and mass Zithromax treatment was implemented in the past several years.

Among the socio-demographic factors age of children had significant association. Those children aged 1-5 years were 2.81 times more risk than children aged 6-9 years. The result of this study is in line with the study done in other rural parts of Ethiopia south Wollo, Kaffa zone and Nepal [21,23,24] The reasons might be preschool children or age below five cannot care for themselves, they have more contacts, play close together and had little knowledge.

Other socio economic factors which have a statistically significant association with trachoma were poor households' perception on their economy, lower average monthly income, and currently enrolled at school. Children who were living in households perceived their economy as poor or very poor were almost 4 times more risk than those who were living with households perceived themselves as rich. The finding of this study in line with the study conducted in Nepal [24]. This may be due to better chance of having personal cleanliness, environmental improvements and better educational status of the parents. Likewise, children from households getting less monthly income were more likely to have trachoma than those from households getting more income (AOR=2.41, 95% CI: 1.08, 6.69). A similar outcome was reported in Baso Liben east Gojjam, Ethiopia and southern parts of Ethiopia [17,25]. On the other hand children who currently enrolled at school were less risks of having trachoma when we compare to children who were not enrolled at school during the time of this study(AOR=0.41, 95% CI: 0.23, 0.86). The result of this study concordat with the study conducted in south Wollo [21]. The possible explanation could be due to effects of poverty on health care, lack of hygiene, high chance of sharing tools, immunity status, and less access to information, education and communication media on trachoma prevention, community based health education by trained health workers or volunteers and eye care units in the District were encouraged in the study area.

The frequency of children face washing had a significant association with the prevalence of active trachoma. Children washed their faces infrequently had 5.96 times higher chance, whereas washing once daily had 2.01 times higher chance of having trachoma when we compare to children who had having washing three times daily. This result is similar with the previous studies conducted in Ethiopia (Tewodros. T and Alemu Y) Southern Rural Ethiopia and the impact of water supply on trachoma prevalence. The prevalence of active trachoma was higher in children who washed their faces once per day than those who washed two or more times (P<0.01) [26,27], and the study done in Southern Sudan showed significant association between active trachoma and washing faces of children three or more times, (AOR=0.4; 95%, CI: 0.3-0.7) [16]. The reason is due to continuous interruption of contact between vectors and children (reservoirs).

There was highly significant association between the prevalence of active trachoma and face cleanliness. Children who were having unclean faces had 7 times more likely to develop active trachoma than children who were having clean faces (AOR=7.01 95%CI: 3.89, 15.17). Among 71 children who had sign of TF, 46 children (64.8%) were having unclean faces. This result is in line with the study done at Southern Sudan and Tanzania [16,28]. On top of that children who did not use soap during washing had 3.54 times increased risk of trachoma compared to those children who uses soap during washing. Moreover children live with higher fly density household had having an increased risk of trachoma in our study. For instance children who live with house hold fly density of 4-7 and fly density greater than 7 (AOR=3.98 95%CI: 2.01, 10.72), (AOR=4.22 95% CI: 2.37, 12.95) respectively when we compare to children living with a household fly density of 1-3 flies. The result obtained in this study is in line with previous studies conducted in Tigray region Ethiopia, east Gojjam, Ethiopia, Tanzania and Nigeria [12,17,29,30]. The definite reason for this was purely due to sustainable keeping of faces cleanliness by using soap were the key to abolish flies contact (vector) which is the main cause and transmission of trachoma.

Among environmental factors the availability of pit latrines had significant association with trachoma. Those children who were living without latrines owned households were 2.05 times more likely to develop active trachoma. This finding goes with the study conducted in Rural Southern Ethiopia and Southern Sudan which showed significant association between latrines availability and active trachoma, (AOR, 0.31, 95% CI: 0.11, 0.89) and (AOR=0.4; 95% CI: 0.2, 0.9)

respectively[16,24,31]. In addition there was also a similar finding in the study conducted in Nepal [7]. This is due to the bacterium Chlamydial trachomatis is carried by the fly Musca Sorbens (eye seeking flies) to the human faces; human faeces is the best comfortable media for Musca-Sorbens breeding. Therefore, the presence and use of latrine have broken this channel.

In general trachoma is a communicable disease, the transmission of which is heavily dependent on poor socio-economic and environmental conditions. In areas where it remains the leading cause of blindness, a combination of encouraging regular programs must be functional. In the study area it is recommended that, in addition to regular detection and treatment of people with active trachoma, families and individuals should be encouraged to do something to protect themselves from the infection. That is teaching them to increase the number of times that their children wash their face to keep clean and to reduce flies that are attracted by dirt in the face.

In conclusion, this study found active trachoma in children to be independently associated with lower age, low socio-economic status, poor face washing habit, not using soap during washing, absence of clean face, absence of waste disposal, and higher house hold fly density were risk factors identified in this study.

Limitations of the Study

The findings of this study should be viewed in light of the following limitations: We might have introduced a sampling error since we employed cluster sampling technique. The random and systematic measurement error in this study might attenuate the association observed. The relatively small number of our sample estimated 1.5 design effect rather than the suggested 4 might dilute the potential true effect of some covariates. Hence, generalization of the findings in this study may not be possible. Finally social desirability bias was inevitable due to lack of qualitative data to triangulate the result obtained in this study and usage of community nurses as data collectors.

Declaration of Competing Interest

The authors declared that they have no competing interests.

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Author Contribution

MA: conception and initiation of the study, in the design, data collection, ME: Data analysis, manuscript development and write up and, MY: edition, revision of the final manuscript and co-writing. All authors read and approved the manuscript.

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