

Trachoma in Sudan: Case Series from Two Eye Care Hospitals and a Review of the Literature

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Abstract

Background

Trachoma is a common infectious cause of blindness worldwide. Although it has largely now disappeared from developed countries, it is still endemic in many developing countries. We aimed to highlight clinical stages and common related socio-demographic and household characteristics among patients with trachoma in Sudan.

Methods

A hospital-based case series descriptive study was conducted at Makah Eye Complex and Abdalfadeel-Almaz hospital in Khartoum, Sudan. We included all Trachoma patients from all age groups attending the two eye care hospitals in the period from 1st to 31st March 2015. Data was collected through clinical examination, hospital records, and face to face interview using a structured questionnaire, Also, we conducted a review of the literature to highlights the epidemiological aspect of trachoma in Sudan, using the databases of MEDLINE (PubMed) and Google Scholar.

Results

In this case series, we identified 125 patients with trachoma in the study period. Most of them were aged more than 50 years old (78.4%). Half of the participants (56%) were positive for active trachoma, 40.8% of them were having Trachomatous Trichiasis (TT), and 56% of them have Trachoma Follicles (TF). Majority of the patients have low socioeconomic status and poor personal and environmental hygiene (88%), (44%) and (74.4%), respectively.

Conclusion

Low socioeconomic status and poor personal and environmental hygiene are common socio-demographic and household characteristics among patients with trachoma. Despite the progress that has been made towards disease elimination, trachoma is still a public health problem in Sudan. Our review highlights the magnitude of trachoma and the progress towards its elimination in Sudan.

Background

Trachoma is a chronic cicatrizing conjunctivitis caused by *Chlamydia trachomatis*, which leads to progressive scarring of the lids and the cornea [1]. It is considered the leading cause of preventable blindness worldwide for being responsible for more than 3% of the world's blindness. According to the World Health Organization (WHO), trachoma is endemic in more than 50 countries worldwide and is responsible for the visual impairment of about 1.8 million people, of whom 0.5 million are irreversibly

blind, representing about 1.4% of the global total of blind individuals [2-3]. Approximately 232 million people live in trachoma endemic areas and are at risk [2-3].

The disease is largely related to environmental risk factors; the strongest of which is poor hygiene, most likely reflecting poor access to water, latrine use, and lack of sanitation, thus promoting transmission by providing suitable breeding sites for eye-seeking flies [4-5]. Personal risk factors relate to face and hands washing regardless of the distance to the water source [6]. The clinical manifestations of trachoma are subdivided into those with “active” disease, commonly seen in childhood, and those associated with “chronic” complications like Trichomatous Trichiasis (TT) and corneal opacification (CO), usually seen in late childhood and adults [7].

Trachoma has long been known to be prevalent in parts of Sudan and the number of cases of TT in endemic areas is 67,000 patients [8]. Sudan is among the five countries at which half of the global burden of active trachoma is concentrated and among the three countries at which half of the global burden of TT is concentrated [8]. In Sudan, there is paucity in studies that highlight the most common related factors and clinical stages among trachoma patients. With this background, the current study aimed to describe the clinical stages of trachoma and the common presenting socio-demographic and household characteristics among trachoma patients.

Methods

A descriptive, case series study was carried out from the 1st of March to the 31st of March 2015 in Makah Eye Complex and Abdalfadeel-Almaz hospital, Khartoum state, Sudan. These two settings were chosen because they are the main public healthcare facilities providing specialized clinical ophthalmological services for a great number of the Khartoum state population.

We included all patients with definite clinical signs of trachoma from all age groups according to the World Health Organization (WHO) Trachoma grading system. Structured face to face interviews with patients used to assess socio-demographic and household characteristics, using a structured questionnaire. The main parts were the study population, demographic characteristics and assessment of environmental and personal hygiene. Before filling the questionnaire, all patients who came to the clinic were examined for the presence of trachoma, and once found positive, the patient was referred to the consultant ophthalmologist to prove diagnosis and prescribe the appropriate medication.

Furthermore, we conducted a review of the recent literature to summarize the relevant studies about current epidemiological aspects of trachoma in Sudan, through searching the databases of MEDLINE (PubMed) and Google Scholar, from January 2000 to July 2020.

Ethical consideration and consent

Permission for conducting this research was granted from the Faculty of Medicine, University of Khartoum before study initiation, and permission was also granted by the general directors of Makah Eye Complex and Abdelfadeel-Almaz hospital, Khartoum, Sudan. Ethical approval was obtained from the State Ministry of Health in Khartoum state, Sudan. Each patient's informed consent was obtained before participation in the study.

Results

Socio-demographic and household characteristics

The study included 125 patients with trachoma from two eye care hospitals; 80 patients (60.4%) were from Makah eye complex and 45 patients (35.2%) were from Abdelfadeel-Almaz hospital. There were 68 patients (54.4%) females and 57 males (45.6%) males. The majority of the participants (78.4%) were aged more than 50 years. Most of the respondents (61.6%) were resident in Khartoum state, and (16.8%) were from Gezira state. Most of the respondents (81.6%) were not having an infected person in the family (Table 1).

Regarding drinking water, most of the respondents 98 (78.4%) had a pipe inside the house, 8 % (10) had a pipe outside the house as a source of water supply. More than half (59.2%) of the respondents have animals and 52.2% of them have them inside their houses. The majority of the respondents (74.2%) were having pit latrines as a type of toilet, whereas 2.4% were not having toilets at all. Most of the respondents (68.8%) were washing their faces 2-5 times per day, and 4.8% never wash their faces. Regarding hands washing, the majority (54.4%) were washing their hands 2-5 times per day (Table 2).

Clinical stages of Trachoma

All patients were examined on slit lamp by the ophthalmologist and the clinical signs of trachoma were graded in accordance with WHO Trachoma Grading System. Most of the respondents (56%) were found to have trachoma follicles (TF) and 40.8% of them were having trachomatus trichiasis (TT) (Table 3).

Table 1
Socio-demographic characteristics of the study population attending two eye care hospitals in Khartoum state, March 2015. (n=125)

Variable		No.	Percent %
Hospital	Makkah eye complex	80	60.4%
	AbdelfadeelAlmaz	45	35.2%
Gender	Male	57	45.6%
	Female	68	54.4%
Age	Less than 15 years	1	0.8%
	15-29 years old	7	5.6%
	30-49 years old	19	15.2%
	More than 50 years	98	78.4%
Residence	Khartoum state	77	61.6%
	Gezira state	21	16.8%
Infected person in the family	Present	102	81.6%
	Absent	23	18.4%
Level of education	Illiterate	66	52.8%
	Khalwa	22	17.6%
	Primary school	17	13.6%
	Secondary school	11	8.8%
	University graduate	8	6.4%
	Post graduate	1	0.8%
Monthly income	Less than 1000 SDG	36	28.8%
	1000-2000 SDG	9	7.2%
	More than 2000 SDG	3	2.4%
	Unemployed	76	60.8%

Table 2

Environmental factors and personal hygiene among patients with trachoma attending two eye care hospitals in Khartoum state, March 2015. (n=125)

Variable		No.	Percent %
Drinking water source	House pipe	89	78.4
	External pipe	1	0.8
	Wells	6	4.8
	Rivers	2	1.6
Place of Animals breeding (if present)	Inside the house	66	86.8
	Inside the residential block	10	13.2
Type of toilets	Flush toilets	29	23.4
	Pit Latrine	92	74.2
	No toilet	4	2.4
Face washing per day	Once	8	6.4
	2-5 times	86	68.8
	More than 5 times	25	20
	Never	6	4.8
Hands washing per day	Once	4	3.2
	2-5 times	68	54.4
	More than 5 times	52	41.6
	Never	1	0.8

Table 3
clinical stages of trachoma among patients with
trachoma attending two eye care hospitals in
Khartoum state, March 2015

Clinical stage	No.	Percent %
Trachoma Follicles (TF)	70	56.0
Trachoma Scarring (TS)	2	1.60
Trachoma Trichiasis (TT)	51	40.8
Corneal Opacification (CO)	2	1.60

Characteristics of the studies included in the review

Our search retrieved records for 93 published articles. Abstract and full texts of the potentially relevant studies were retrieved for screening and studies lacking insufficient data about the outcomes of interest were subsequently omitted. Lastly, a total of nine epidemiological studies published from 2007 to 2020 which met the eligibility criteria were included [9-17]. Main features and summary of the data from the included studies are shown in (Table 4).

Low socioeconomic status and poor personal and environmental hygiene were the common reported socio-demographic and household characteristics among patients with trachoma in all studies. Particular areas in Sudan exhibited higher burden of Trachoma, where prevalence of trachoma was above the WHO thresholds, specifically Gadarif state and all of five Darfur states. The presence of one million South-Sudanese refugees in displacement camps in White Nile state coming from a trachoma hyper-endemic country could impact the progress towards trachoma elimination [14].

In attempts to eliminate trachoma, Sudan National Trachoma Control Program (NTCP) adopted the WHO-SAFE strategy; (Surgery for Trichiasis; Antibiotic therapy through mass distribution; Facial cleanliness promotion through health education; and Environmental improvement with sanitation) [17]. Recently, NTCP piloted a TT case-finding approach in some localities to identify patients and provide surgical services free of charge [17]. However, conflicts and security concerns in several endemic areas of Sudan limits the ability of NTCP to reach trachoma elimination in Sudan [11].

Table 4
Descriptive summary of the studies included in the review

Study	Year	Study setting	Main findings
Rushood et al [9]	2007	Total coverage survey for of all governmental primary schools children in Khartoum State.	<ul style="list-style-type: none"> - Out of 671,119 children screened, 288 children had active trachoma: 86.5% of them were from Ummbada locality, where poverty is widespread.
Islam et al. [10]	2009	Local population of Nyala city, South Darfur state, in the free medical camps established by Pakistani Field Hospital.	<ul style="list-style-type: none"> - Out of 4326 individuals examined during the medical camps, 378 (8.73%) had clinical signs of trachoma. - 45.5% of patients were less than 20 years of age. - Most of patients had poor personal hygiene and low socioeconomic status with lack of basic facilities such as proper house, clean water and covered latrines. - TF and TI were observed in 81.34% and 50.37% of patients respectively. - TT and CO was observed in 19.1% and 14.5% of patients, respectively.
Hassan et al [11]	2010	Large population based cross-sectional survey conducted in 88 localities across northern states of Sudan	<ul style="list-style-type: none"> - Out of 106,697 participants examined, 31,072 patients had TT. - Higher prevalence of TF (more than 10%) in three districts: two in Blue Nile State (Geissan and Kurmuk); and one in Gederaf State (El Galabat East). - Higher prevalence of TT (above the WHO threshold for community based intervention of 1%) in 20 districts. - Prevalence of TT increased significantly with age and females compared to males. - Factors associated with presence of a child with trachoma: Increasing household size, household head with no formal education, livestock in compound, and pit latrine
Elshafie et al [12]	2016	Cross sectional, community-based survey covering Khartoum State and all accessible districts in the five Darfur States	<ul style="list-style-type: none"> - 73,489 residents examined in 908 villages. The highest prevalence of TF in children was found in El Fashir district, North Darfur state (18.7%). - Five districts (El Fashir, Zalinji, Azoom, Maleet, and El Koma) had TF prevalence above the WHO threshold (10%) for mass

			<p>treatment with azithromycin, together with facial cleanliness and environmental improvement interventions.</p> <p>- TF in children was independently associated with younger age, unimproved sanitation in the household, having ≥ 5 children in the household, and living in internally displaced persons camps.</p>
Alkhidir et al [13]	2017	Population-based prevalence study of Trachoma among children in Tabldiya village, Gadarif State	<p>- 11.0% of the 900 participants had active trachoma; 3.96 % of them had TF, and none had TI.</p> <p>- The prevalence of <i>Chlamydia trachomatis</i> in whole children in the village was 1.4%</p>
Sanders et al [14]	2019	Cross-sectional, multi-stage, cluster-random surveys in refugee camps in two localities (Al Salam and Al Jabalain) White Nile State	<p>- Prevalence of TF in children was 15.7% in Al Salam and 10.6% in Al Jabalain.</p> <p>- Prevalence of TT in those 15 years above was 2.9% in Al Salam and 5.0% in Al Jabalain.</p> <p>- Participants in these two refugee camps reported coming from four states in South Sudan (Upper Nile, Unity, Jonglei, and Western Bahr el Ghazal states).</p>
Macleod et al [15]	2019	Secondary analysis of data from 27 cross-sectional population-based trachoma prevalence surveys carried out in the internally displaced persons camps in the five Darfur States	<p>- Out of 1926 children examined, 38 (8%) had TF. Poor sanitation, younger age and living in a household that purchased water from a vendor were associated with TF in children.</p> <p>- Out of 2139 adults examined, 16 (0.7%) had TT. TT was strongly independently associated with being older and living alone.</p>
Sanders et al [16]	2019	Population-based Trachoma prevalence surveys in seven localities across five states of Sudan (Gadarif, Red Sea, Sinnar, Blue Nile, and South Kordofan).	<p>- Out of 22,548 individuals included, prevalence of TT was (0.4% to 6.4%) in children less than 9 years, and was (0.1% to 4.4 %) in those aged 15 years and older.</p>
Sanders et al [17]	2020	Piloting a TT patient case-searching approach in Gadarif state	<p>- Out of 66,526 residents examined, local case finders suspected that 491 residents had TT. Of them, 369 were confirmed for TT and needed surgical intervention.</p> <p>- TT case-finding approach provides an example of an effective method for identifying TT patients</p>

Discussion

Most of the patients in this case series were females aging more than 50 years who have low socioeconomic status and poor personal and environmental hygiene. The majority of the patients were aged more than 50 years old, which is unlike another study in a Gambian village that showed trachoma to be found mainly in children [18]. The percentage of females patients is greater than males, this is expected and can be explained by the fact that mothers are the caregivers and are in close proximity with the reservoir of trachoma which is children less than 15 years old making them at a higher risk to get infected with trachoma. And this result is similar to other studies [19].

We observed that most of the patients in this series came for complaints other than trachoma and were diagnosed with trachoma accidentally. This is explainable because doctors think that trachoma is not common nowadays, especially in Khartoum state. This misconception affects the determination of the actual magnitude of trachoma.

With regard to socioeconomic status, most of the respondents were having poor socioeconomic status. Poor socioeconomic status is associated with poor housing and crowdedness, resulting in an increased risk of developing and transmitting the infection [7, 20]. Some of the respondents (18.4%) reported the presence of a person infected with trachoma in the family. Studies showed the clustering nature of the disease at the community, household, and bedroom levels, reflecting the dynamics of transmission between family members with prolonged close contact [21–22]. However, patients may not be aware if someone in his family members carrying trachoma silently, which could underestimate the disease burden and delay seeking treatment.

Regarding personal hygiene, most of the respondents have poor personal hygiene in term of facial cleanliness and hands washing. Facial cleanliness is the third issue in the WHO-SAFE strategy and it was addressed by many studies [6, 23–25]. The dirty face is defined by the presence of ocular and/or nasal discharge [6].

Most of the respondents have poor environmental hygiene. Many studies reported that as the distance to the water supply is increased, the prevalence of trachoma is increased [26], and other studies proved that the quantity of water used for washing faces is more important than the distance to water [27]. More than half of the respondents have animals and 86.8% of them have animals inside their houses. The animal's feces are good media for flies to accumulate, flies being considered as a vector for *Chlamydia trachomatis*. This is expected and proved by so many other studies [28]. Most of the respondents (73.6%) have pit latrines inside the houses as a type of toilet, making it also a suitable environment for flies [4–6]

Conclusion

Low socioeconomic status and poor personal and environmental hygiene are common socio-demographic and household characteristics among patients with trachoma. Lack of the awareness may aid in underestimation of the actual magnitude of trachoma. Our review highlights the magnitude of trachoma and the progress towards its elimination in Sudan.

List Of Abbreviations

WHO: World Health Organization;

TF: Trachomatous inflammation - Follicular

TI; Trachomatous inflammation - Intense

TS: Trachoma scarring

CO: Corneal opacification

Declarations

Ethical approval and consent to participate:

Permission for conducting this research was granted from the Faculty of Medicine, University of Khartoum before study initiation, and permission was also granted by the general directors of Makah Eye Complex and Abdalfadeel-Almaz hospital, Khartoum, Sudan. Ethical approval was obtained from the State Ministry of Health in Khartoum state, Sudan. Each patient's informed consent was obtained before participation in the study.

Consent to publish

not applicable.

Availability of data and materials:

The dataset generated during this study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors contribution

(RH) undertook the conception of the research idea and data collection; (FS, HM) involved in study design and questionnaire development and supervised the whole research process; (RH, MA, RH, and SM) interpreted the results and drafted the manuscript. All authors revised and approved the final manuscript.

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