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Rapid assessment of trachoma in Hainan Province, China: Validation of the new World Health Organization methodology

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Abstract This study was undertaken to validate a WHO methodology for the rapid assessment of trachoma. Fourteen villages were chosen by random sampling in two counties in Hainan Province, China. For the rapid assessment, trichiasis patients were identified, 50 children ages 1–10 years were examined for active trachoma, and information was collected on community access to services and community risk factors. To validate the methodology, a prevalence survey was undertaken simultaneously in the same villages. For the prevalence survey, 2428 people from 1606 households in the 14 villages were chosen by random sampling. Very little active trachoma was found by either method, although the rates of trichiasis were more substantial. Ranking of the villages by the two methods for trichiasis was highly correlated (Spearman's correlation coefficient = 0.60, p = 0.02). For active

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trachoma, the Spearman's correlation coefficient for the ranking of villages by the two methods was 0.40 and not significant ($p = 0.14$), suggesting that a correlation this close may have been seen by chance alone. The observational data showed all the villages to be at risk of active trachoma (due to poor environmental hygiene conditions), suggesting that this aspect of the WHO methodology overestimates the risk for active trachoma. We conclude that, with the exception of the community assessment of risk, this rapid assessment methodology is a valid tool for the assessment of trichiasis and possibly of active trachoma in rural communities, although the level of active trachoma in this study was too low to effectively validate that aspect of the methodology.

Key words Trachoma prevalence; trachoma rapid assessment; trichiasis; World Health Organization; developing countries; risk factors; China

Introduction Trachoma is an ocular chlamydial infection affecting approximately 150 million people worldwide.[1] It is the leading infectious cause of blindness, and the second cause of blindness after cataract. Repeated infection with the organism *Chlamydia trachomatis*, beginning in early childhood, leads to scarring of the conjunctiva, which eventually causes the eyelid to turn inwards.[2] Eyelashes scratching on the cornea, often accompanied by superinfection of a bacterial or fungal nature, leads to the corneal opacities that impair vision. Crowded living conditions, lack of water and sanitation services in the community, and fly breeding sites near the homes are some of the many risk factors for trachoma in a community.[3–5]

The World Health Organization's Alliance for the Global Elimination of Trachoma (constituted in 1997) developed a methodology for the rapid assessment of trachoma. This document, entitled "Guidelines for Rapid Assessment of Blinding Trachoma",[6] was designed to provide a method for the quick and inexpensive assessment of the trachoma status of a community, with an emphasis on active trachoma in children, the principal reservoir of infection, and trichiasis, the blinding stage of trachoma in adults. The impetus for developing a rapid assessment method comes from the understanding that prevalence surveys are expensive, time-consuming and require the participation of a team of people with both field research and clinical experience.

The rapid assessment methodology has been field tested and/or formally validated in Morocco, Mali[7] and Tanzania.[8] This study was undertaken to validate the WHO rapid assessment methodology in an Asian country. The island province of Hainan, in southern China, was the site of this study.

This study was undertaken in partnership with the Department of Ophthalmology of the People's Provincial Hospital of Hainan, members of the Zhongshan Ophthalmic Center (ZOC), and Helen Keller Worldwide, with financial support from Pfizer Inc. The study was undertaken in July and August 1999.

Materials and methods

COUNTY- AND VILLAGE-LEVEL SITE SELECTION The validation study was undertaken in seven villages in each of two counties of Hainan Province, Dongfang (western, seaside county) and Changjiang (central, mountainous county), selected by the provincial health authorities on the basis of numbers of trichiasis cases seen in health services and data from prior decades. Both the rapid assessment and the prevalence survey were undertaken in the same 14 villages, simultaneously. The seven villages per county were chosen by random sampling from all the rural villages in the county (152 villages in Dongfang and 75 villages in Changjiang). Villages with populations less than 500 or greater than 5000 were excluded on the assumption that the smaller ones might not have 50 children under age 10 and the larger ones would be more urban. The sample included both minority (Li) and non-minority (Han) populations.

RAPID ASSESSMENT The WHO "Guidelines" outline a methodology for gathering three distinct types of data within a community: 1) data on active disease in children under the age of 10, 2) data on trichiasis in the community's adults, and 3) data on the physical environment of the community and access to health care. Community leaders were involved in all aspects of the data collection. A planning workshop was held for the secretaries of the villages and the community doctors in both counties prior to field work. The purpose of the workshop was to explain the goals of the study, to collect information on the population and health conditions in their villages, and to organize the field work.

Active disease in children under the age of 10 was measured through examination of the eyes of 50 children from at least 15–20 households chosen from neighborhoods assumed to be at higher risk for trachoma based upon discussion with the village leaders. The households were visited by the village leaders before the study team arrived, and the children ages 1–9 years were asked to come to the central site for the eye examination. A member of the household was given an ID card on which the name of the individual, a household ID number, and the number of children under 10 years in that household were written. Children were graded for Follicular Trachomatous Inflammation, TF, and Intense Trachomatous Inflammation, TI (active trachoma) only, and their faces examined for cleanliness, at the examination site.

To determine the pattern of trichiasis in the communities' adults, the village secretary and community doctor were asked to prepare a list of potential trichiasis (TT) patients prior to the day of the study team's arrival. At the planning workshop, trichiasis was described and pictures of trichiasis patients were shown. Local terms for trichiasis and the practice of epilation were discussed. Patients identified as having trichiasis by the community leaders and village doctors in a house-by-house assessment were given an ID card, and requested to come to the central site on the day of the study. The trachoma graders in the study team confirmed (or did not confirm) the diagnosis of trichiasis by clinical examination.

Data on the physical environment of the community and its access to health services were gathered through interviews with village leaders, by touring the village, and by examining the state of the homes during the identification of the children to be examined for active trachoma. The WHO rapid assessment forms, translated into Chinese, were used, but interpretation of the observational variables was provided to the study teams during the training session. The household roster (form 3 from the "Guidelines") gathers information, by interviewers' observation, of 1) "households with an adequate system of elimination of human excreta", 2) "households not exposed to potential fly breeding sites", and 3) the number and percentage of children with a "clean face". In the context of Hainan Province, these risk factors were defined as 1) households with a latrine for both urine and feces (not for urine only); 2) households in which animals did not live in the house or loose in the yard, where there were not many flies flying around the kitchen or the (open) latrine, households without a garbage or manure pile or pig wallow in the yard; and 3) number of children whose faces were free of flies on the eyes, with clean noses, and no visible dirt on the face.

PREVALENCE SURVEY In order to validate the rapid assessment methodology, a prevalence survey, the "gold standard" for trachoma assessment, was undertaken simultaneously in the same rural communities. The prevalence survey was conducted using the methodology described in the WHO manual "Primary Health Care Level Management of Trachoma".[9]

Every village had a village registration book that listed the name, age and sex of the entire village population, by household. This book was used to draw a systematic sample of 100 households per village for inclusion in the study. Village leaders were given the list of households chosen for the sample before the day the study team was to arrive in the village. They visited the household and asked the family to go to the examination site on the day of the study.

Examinations of all residents from these households were undertaken at a central location. Both eyes were graded for all five signs of trachoma, using the WHO simplified trachoma grading system.[10] These signs include TF and TI, the two signs indicating "active trachoma" as mentioned above, TS or Trachomatous Scarring, TT and CO or Corneal Opacity. The village leaders were also instrumental in finding individuals who did not come for the examination and making arrangements for them to be included in the study.

Risk factor and demographic information on the households in the sample (such as minority/non-minority status, number of family members working outside the home, water and sanitation facilities in the home or yard, number of rooms in the home and educational level of the family members) was gathered through interview of the head of the household at the examination site. Often, the village leaders assisted the team leaders in the interview process. All the prevalence forms and questionnaires were finalized in consultation with the Hainan provincial health team and the ZOC team, and translated into Chinese.

TRAINING OF TRACHOMA GRADERS AND INTERVIEWERS To assure standardization of data collection, a training workshop was held with all team members. Training included presentations on trachoma and its epidemiology, the purpose of the study, and community actions that can be undertaken to control trachoma. For trachoma graders, training also included demonstration of how to examine the eye for trachoma, and how to recognize and record on the study forms the five grades of the simplified trachoma grading scheme: TF, TI, and TT, as defined above, Trachomatous Scarring (TS) and Corneal Opacity (CO). The training included a simple reliability study, and field experience with supervision.

INFORMED CONSENT AND TREATMENT This study was undertaken in accordance with the guidelines of the "Declaration of Helsinki". Interviewers obtained informed consent from each adult and from the parents/guardians of each child, before eye examinations or interviews were conducted.

Children and adults identified with active trachoma in either survey were treated with tetracycline eye ointment. Adults identified with trichiasis (or with cataract or another health problem identified by chance by the team members) were referred to the nearest facility for surgery or treatment.

Results

RESULTS OF RAPID ASSESSMENT OF ACTIVE TRACHOMA AND TRICHIASIS A total of 750 children under the age of 10 were examined during the rapid assessment, 361 in Dongfang county and 389 in Changjiang county (see Table 1). Rates of active trachoma in children under age 10 were low in both counties: 1.94% (7 cases) in Dongfang and 1.29% (5 cases) in Changjiang.

Of the 6091 people living in the seven villages studied in Dongfang county, 65 (1.07% of the total village population) had trichiasis as determined through the rapid assessment (see Table 2). Of 14,255 people living in the seven villages visited in Changjiang, 95 (0.67% of the total population) had trichiasis. The majority of the trichiasis cases had no accompanying corneal opacity. In Dongfang county, 16 of the 65 cases (25%) had had prior trichiasis surgery, and most of them were living in one of two villages.

RESULTS OF THE PREVALENCE SURVEY OF ACTIVE TRACHOMA AND TRICHIASIS A total of 1135 people were examined in seven villages in Dongfang county, and 1292 people in seven villages in Changjiang county. Compliance was high; over 85% of people selected for the study were examined.

Very low rates of active trachoma (TF and/or TI) were seen in both counties. The percentage with TF was 2.3% among children under age 10 in Dongfang county and 1.9% among children under age 10 in Changjiang county. Intense trachoma inflammation (TI) was less common than TF; rates of TI in children in the two counties were 0% and 0.8%, respectively.

TABLE 1. Active trachoma in children assessed by the rapid assessment method.

County	Active Trachoma (TF/TI)[1]	
	Total Examined	Number (%)
Dongfang	361	7 (1.94)
Changjiang	389	5 (1.29)
	750	12 (1.6)

[1]Follicular Trachomatous Inflammation and Intense Trachomatous Inflammation.

TABLE 2. Trichiasis detected in adults of two counties by the rapid assessment method.

County	Population Examined	Total Trichiasis (%)
Dongfang	6,091	65 (1.07)
Changjiang	14,255	95 (0.67)
Total	20,346	160 (0.79)

Trichiasis (TT) was observed in 15 cases (3.3%) of the adult study population (defined as men and women over the age of 15 years) in the sample from Dongfang County, and seven cases (1.8%) of the adult study population in Changjiang County. In addition, the rates of TS observed in the adult population were quite high – 15.5% in Dongfang County, and 26.3% in Changjiang County.

RANKING OF THE VILLAGES FOR ACTIVE TRACHOMA AND TRICHIASIS BY TWO METHODS The villages were ranked from highest to lowest rates of active trachoma and of trichiasis by the two methods (see Table 3). Note that for active trachoma, three out of the five highest ranked villages by the prevalence survey were also ranked among the five highest villages by the rapid assessment (villages 14, 9 and 4). The same holds true for trichiasis. Three of the five highest ranked villages by the prevalence survey (villages 1, 13 and 3) were also among the five highest ranked by the rapid assessment. For trichiasis, the ranking of villages by the rapid assessment and by the prevalence survey was significantly and strongly correlated (Spearman's correlation coefficient = 0.60, $p = 0.02$). For active trachoma, the Spearman's correlation coefficient of the ranking of villages by the two methods was 0.40 and not significant ($p = 0.14$), suggesting that a correlation this close may have been seen by chance alone. Given the very low level of active trachoma found, this is not a surprising result.

DATA ON RISK FACTORS The WHO rapid assessment "Guidelines" provide for the collection of data on living conditions that are known in trachoma research to be associated with active trachoma. These data are used, along with the clinical signs, to score communities by their level of risk for blinding trachoma. Rough estimates of the percentage of homes in a village with these risk factors, such as fly breeding sites and latrines, are collected by interviewers through observation.

Village	Population Prevalence				Rapid Assessment			
	% TF/TI[1]	Rank TF/TI	% TT[2]	Rank TT	% TF/TI[1]	Rank TF/TI	% TT[2]	Rank TT
1	5.4	2	13.0	1	0	6	2.1	2
2	1.3	9	6.7	3	6.2	2	0.7	7
3	2.2	7	3.7	5	2.7	3	2.9	1
4	2.5	5	2.9	6	2.0	4	0.6	8
5	0	11	1.2	8	0	6	0.1	11
6	2.2	7	0	9	0	6	1.2	5
7	2.3	6	0	9	2.0	4	0.3	10
8	0	11	0	9	0	6	0.3	10
9	4.7	3	0	9	1.8	5	0.0	12
10	2.6	4	5.4	4	0	6	0.8	6
11	1.4	8	0	9	0	6	0.4	9
12	0	11	1.6	7	0	6	1.1	6
13	0.8	10	10.0	2	0	6	1.5	4
14	5.5	1	0	9	7.4	1	1.7	3

TABLE 3. Percentage of active disease in children, and of trichiasis in adults, and the ranking of villages by the prevalence survey and by the rapid assessment method.

[1]Percent of children under 10 years of age.
[2]Percent of trichiasis in adults over 15 years of age in study sample.
[3]Percent of trichiasis in total village population (all ages).

In all but two of the villages in Dongfang County, over 90% of the households visited were exposed to fly breeding sites and had no latrines. In the remaining two villages, over half the households were observed to have these risk factors. In Changjiang County, over 90% of households visited in all seven villages were exposed to fly breeding sites, and in three of the seven villages, over 90% of households also had no latrine. In the remaining four villages, over 50% of households visited had no latrine. Roughly half of the children in the rapid assessment sample had clean faces, in both counties.

Discussion The rapid assessment method and the prevalence survey gave remarkably similar estimates of active trachoma and of trichiasis in the communities studied. However, the validation exercise would have been more meaningful had rates of active trachoma in the communities been higher. The Spearman correlation coefficient was strong and significant when comparing the village ranking for trichiasis by the two methods, but less strong and not significant for the village ranking for active trachoma.

We question the validity of the observational/risk factor data methodology. The vast majority of households were exposed to fly breeding sites and had no latrine, two risk factors for active disease highlighted in the rapid assessment methodology, and yet the rates of active trachoma in children under 10 years of age were insignificant. The risk factor aspect of the rapid assessment methodology overestimates trachoma risk in the community.

We conclude that the rapid assessment methodology outlined in the WHO "Guidelines for Rapid Assessment of Blinding Trachoma" is

a valid tool for the assessment of trichiasis and possibly for active trachoma, although we were not able to assess that due to the low levels of active trachoma in the communities we sampled. The observational data showed all the villages to be at risk of active trachoma (due to poor environmental hygiene conditions), suggesting that this aspect of the WHO methodology overestimates the risk for active trachoma in this Asian context. The risk factor methodology may need to be revised.

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