

A flowchart for managing sexually transmitted infections among Nigerian adolescent females

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Objective To devise a flowchart suitable for assessing risk of trichomoniasis, chlamydia and gonorrhoea in an adolescent population, not all of whom will be sexually experienced or currently in a relationship.

Methods The data used to derive the flowchart were generated from cross-sectional microbiological surveys of girls aged 14–19 years in Port Harcourt, Nigeria. The flowchart screened on the basis of: (i) sexual experience; (ii) recent sexual activity; (iii) a positive urine leukocyte esterase (LE) test; and (iv) among LE negatives, a history of malodorous/pruritic discharge.

Findings Using this flowchart, we found that 26.2% of all adolescents screened would receive treatment for cervicitis and vaginitis. Chlamydial, gonococcal, and trichomonal infections were correctly diagnosed in 37.5%, 66.7%, and 50 % of the cases, respectively.

Conclusion Although the flowchart is more suitable for an adolescent population than the vaginal discharge algorithm used in syndromic management protocols, it still lacks precision and needs adapting to local settings.

Keywords: Sexually transmitted diseases/therapy; Chlamydia infections/diagnosis; Gonorrhoea/diagnosis; Trichomonas vaginitis/diagnosis; Risk assessment/methods; Software design; Cross-sectional studies; Adolescence; Nigeria (source: MeSH).

Mots clés: Maladies sexuellement transmissibles/thérapeutique; Chlamydia, Infection/diagnostic; Gonococcie/diagnostic; Vaginite trichomonas/diagnostic; Evaluation risque/méthodes; Conception logiciel; Etude section efficace; Adolescence; Nigéria (source: INSERM).

Palabras clave: Enfermedades sexualmente transmisibles/terapia; Infecciones por chlamydia/diagnóstico; Gonorrea/diagnóstico; Vaginitis por trichomonas/diagnóstico; Medición de riesgo; Diseño de programas de computador; Estudios transversales/métodos; Adolescencia; Nigeria (fuente: BIREME).

Bulletin of the World Health Organization, 2001, **79**: 301–305.

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Introduction

Sexually transmitted infections (STIs) constitute a major health problem for women worldwide,

especially adolescents, among whom *Chlamydia trachomatis* and *Trichomonas vaginalis* infections are prevalent (1). Both of these infections present with mild or no symptoms, particularly chlamydial infection, and their management among this age group presents a difficult problem. In developed countries trichomoniasis is uncommon, but screening for *C. trachomatis* using deoxyribonucleic acid (DNA) amplification techniques has been recommended (2) and screening programmes for young women have been introduced (3, 4). In developing countries, screening for chlamydial infection is not yet feasible, both because of high costs and the difficulty of reaching the target population.

Traditionally, adolescents have had limited access to sexual health services in developing countries (5), although this situation is changing. The number of clinics catering for adolescents is growing, but it is still critical that diagnosis and treatment of chlamydial infection, gonorrhoea, and trichomoniasis be improved in such clinics (6). The strategy currently recommended for these infections by WHO for women of all ages is syndromic

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Ref. No. 00-0571

management (7). This approach minimizes the use of laboratory tests and enables health providers to treat all infections commonly associated with a given STI syndrome. However, syndromic management of vaginal discharge does not perform well in women of any age (8–15). It is likely to do worse among adolescents who not only are frequently asymptomatic, but who are inexperienced in distinguishing a normal from an abnormal discharge (1). This paper describes a flowchart for management of chlamydial infection, gonorrhoea, and trichomoniasis, which is better suited for adolescents, many of whom present at clinics for reasons other than a suspected STI. In such cases it is useful for health professionals to have a flowchart to establish risk of STI exposure in girls who may or may not have symptoms.

Methods

Cross-sectional surveys using cluster sampling techniques were used to recruit girls aged 14–19 years who were attending five secondary schools in Port Harcourt, Rivers State, Nigeria, or who lived in the same community. The girls were contacted through house-to-house visits and were carefully questioned on their sexual history, and if they were sexually experienced were asked to make a clinic appointment for later screening for STIs. Clinics were held in the schools or in a local health centre, where a “drop-in” centre for young people had been established. Sexually experienced girls were regarded as being sexually active if they reported having had a sexual partner within the previous three months. This was also regarded as evidence of “recent sexual activity”. This definition differs from the WHO risk-screening criteria, which refer to a *new* partner within the previous three months (7).

We have previously described the methods used for specimen collection and laboratory analyses to determine the presence of *C. trachomatis*, *N. gonorrhoeae* and *T. vaginalis* (16), except that, in addition, the leukocyte esterase (LE) urine test was used in this study. This non-specific screening test has previously been incorporated into management protocols (17–20). Briefly, for trichomonal infection, wet-mount microscopy of high vaginal swabs was performed immediately the specimens arrived at the laboratory (within 4–6 h of collection). Gonococcal culture specimens were incubated at 35–37 °C for up to 48 h. The sugar-use test was performed on all oxidase-positive Gram-negative diplococci using Flynn & Waitkin slopes, and antimicrobial sensitivity was performed on gonococcal isolates. *Chlamydia* antigens were detected by enzyme-linked immunosorbent assay (ELISA) (Mastazyme, Mast Laboratories, Bootle, England). All positive and borderline specimens were confirmed by direct immunofluorescence (IMAGEN, Novo-Bio Labs, High Wycombe, England).

Ethical approval for the study was obtained from the Ethical Committee, the Teaching Hospital, University of Port Harcourt. All girls with STIs were

provided with appropriate treatment, i.e. with ciprofloxacin (gonorrhoea), doxycycline (chlamydial infection) or metronidazole (trichomoniasis), and referred to the Teaching Hospital if pelvic infection or other conditions were suspected.

Results

We interviewed 1417 girls to obtain the baseline population from which the flowchart was derived (Fig. 1). Stage 1 in the management process begins with the identification of sexually active girls. Of the total population sampled, 803 (56.7%) had “ever had sex”. Of the 496 (61.8%) sexually experienced adolescents who were screened for STIs, 430 (86.7%) reported having at least one partner in the previous three months and were considered sexually active. Among sexually active schoolgirls, the prevalence of *T. vaginalis* was 9.3%, *C. trachomatis* 2.2% and *N. gonorrhoeae* 1.9%. Among sexually active girls who did not attend school, the corresponding prevalences were 9.8%, 0.0% and 2.0%, respectively. Sexually active adolescents were significantly more likely to be positive for either trichomoniasis, chlamydial infection or gonorrhoea than sexually experienced girls having no recent partner (13.3% versus 4.5%; $P = 0.04$). We did not find cervical infections and positive LE tests in sexually experienced girls with no recent partner, but three had trichomonal infections.

Stage 2 in this flowchart involves LE testing of sexually active adolescents and treatment of those who are LE positive. Of the 429 sexually active adolescents, 28 (6.5%) had a positive LE test and would be treated for cervicitis and vaginitis without further assessment. At stage 3, a total of 401 girls with a negative LE test were assessed on the characteristics of any discharge present. From this group, a further 84 girls with odorous or itching discharges were considered to have cervicitis and vaginitis, making a total of 112/429 (26.1%) of sexually active girls who would be treated.

Table 1 shows the sensitivity and specificity of the different stages of the model for each of the three STIs. The specificity of the LE test was high for each infection, although the sensitivity was low, implying that although the test may not identify a high proportion of girls with an infection, the proportion of false positives would be low. The LE test identified about one-third of trichomonal and gonococcal infections and the positive predictive value for trichomoniasis was 46.4%. Because of the low sensitivity of the LE test, further investigations were required after a negative result. At this stage, symptoms were considered. However, no single characteristic of discharge reported by the girls was reliably associated with the presence or absence of infection, although a report of an itching or odorous discharge was the most indicative. The specificity of these symptoms was about 79% for each infection; the sensitivity being highest for gonococcal infections.

Very few girls reported a “yellow” (i.e. purulent) discharge and its inclusion did not improve the results.

The net result of applying this three-stage flowchart is that 50% of trichomonal infections were correctly diagnosed, but four times as many girls would receive unnecessary treatment. Gonococcal infections were identified successfully 67% of the time, but again a higher proportion of girls would be over-treated. Only 37.5% of chlamydial infections were detected.

Discussion

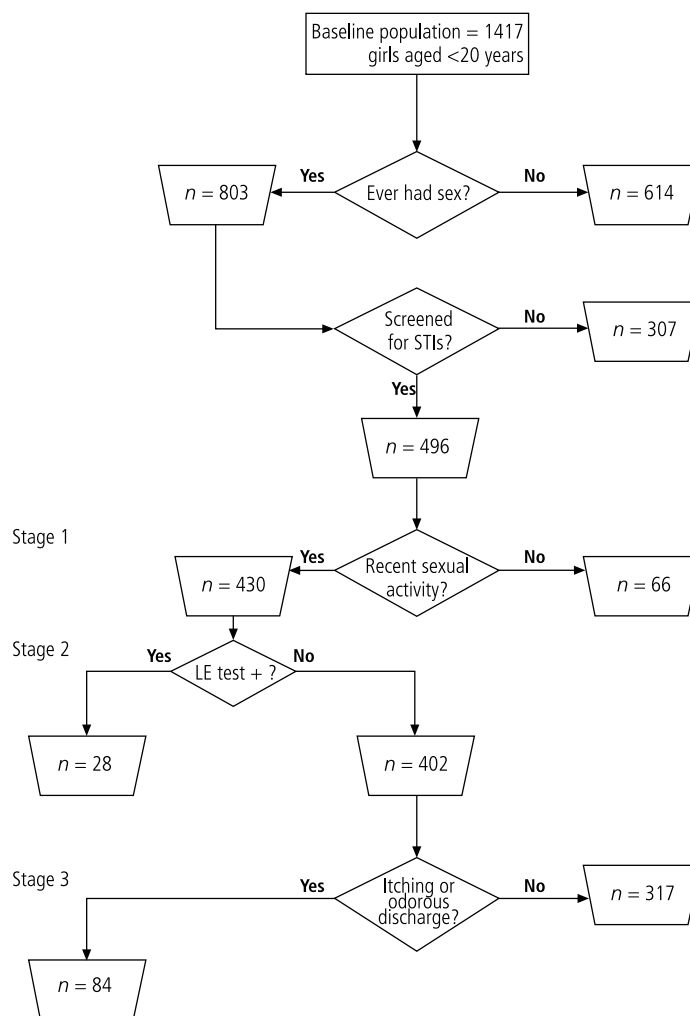
In our flowchart, vaginal discharge was not the entry point, unlike the WHO algorithm (7), nor was a scoring system used (10, 17, 18, 21, 22). Scoring systems have been devised to try to overcome problems inherent in basing STI management on a symptom (vaginal discharge) that poorly predicts cervicitis and leads both to considerable under- and over-treatment. Such systems are complicated to use, however, and are not considered feasible for routine use in developing countries (13).

On present evidence, adolescents with no vaginal discharge should probably be considered as likely to have an STI as those reporting discharge. It therefore appears logical to use a flowchart that uses age as the entry point. Age is not only a surrogate for risky behaviour, but also captures the increased susceptibility associated with biological immaturity. This is reflected in the WHO vaginal discharge flowchart (7), in which being aged <21 years puts a woman at greater risk of cervical infection. Also, many adolescents are not sexually experienced; for example, 44.3% of the Nigerian study population had never had sexual relations (Fig. 1). Most importantly, adolescents are often not in continuous relationships and for those with no recent partner the risk of having a cervical infection is minimal. Adolescents should thus always be asked if they have had recent sexual activity.

Although the LE test provides a more objective means of screening for STIs, it is not sensitive and thus is not a good screening tool. Nonetheless, it had a high level of specificity in the study population and one-third of gonococcal and trichomonal cases were correctly identified and treated. The LE test had a reasonable positive predictive value (46.4%) for trichomoniasis, indicating that it is potentially useful for detecting this infection — an observation that has been made previously (18, 19). This finding is of some importance, since trichomoniasis was the most prevalent infection in this adolescent population.

At stage 3 of the flowchart, reported discharge is assessed, but to avoid over-treatment only discharge considered to be indicative of infection is treated. In doing so, it is accepted that some girls with infections will be missed, since increasing the specificity usually results in a lowering of the sensitivity. In this study population, only 28 additional girls qualified for treatment for cervicitis and

Fig.1. Flowchart showing classification of the study girls at each stage of assessment for treatment of sexually transmitted infections (STIs)



LE = leukocyte esterase

vaginitis. Some of those not qualifying may have had other vaginal infections, such as bacterial vaginosis or candidiasis, and further research is needed to establish whether treatment for these infections should be more generally available for adolescents.

Flowcharts such as the one we have described here may be more suitable for use in adolescent clinics than the WHO algorithm, which was largely derived from samples of older women attending family planning or antenatal clinics and whose sexual exposure was also different. Nonetheless, all such flowcharts are poor substitutes for laboratory testing and cannot be expected to have high positive predictive values. They also need to be adapted to reflect the background prevalence of infection and the sexual characteristics of the population being served. The prevalence of STIs was relatively low among our adolescent study population, and *C. trachomatis* was not detected as often as had been expected. Most girls reported only one lifetime sexual partner and more detailed questioning on sexual behaviour would not have improved the perfor-

Table 1. Sensitivity, specificity and predictive values of a modified flowchart for vaginal discharge in 430 recently sexually active Nigerian girls^a

Infection	<i>Trichomonas vaginalis</i>				<i>Neisseria gonorrhoeae</i>				<i>Chlamydia trachomatis</i>			
	No. +ve	No. -ve	Total	Predictive value	No. +ve	No. -ve	Total	Predictive value	No. +ve	No. -ve	Total	Predictive value
Stage 2^b												
LE +ve	13	15	28	46.4%	3	24	27	11.1%	1	26	27	3.7%
LE -ve	27	375	402	93.3%	6	383	389	98.5%	7	380	387	98.2%
Total	40	390	430		9	407	416		8	406	414	
Sensitivity	32.5 %	—			33.3%	—			12.5%	—		
Specificity	—	96.2%			—	94.1%			—	93.6%		
Stage 3^c												
IOD +ve	7	77	84	8.3%	3	79	82	3.7%	2	80	82	2.4%
IOD -ve	20	297	317	93.7%	3	303	306	99.0%	5	299	304	98.4%
Total	27	374	401		6	382	388		7	379	386	
Sensitivity	25.9%	—			50.0%	—			28.6%	—		
Specificity	—	79.4%			—	79.3%			—	78.9%		
Net results of staged flowchart												
Treated	20	92	112	17.9%	6	103	109	5.5%	3	106	109	2.8%
Untreated	20	297	317	93.7%	3	303	306	99.0%	5	299	304	98.4%
Total	40	389	429		9	406	415		8	405	413	
Sensitivity	50.0%	—			66.7%	—			37.5%	—		
Specificity	—	76.4%			—	74.6%			—	73.8%		

^a Values cannot be calculated for stage 1 because non-sexually active girls were not screened for infections.

^b LE screening.

^c Itching/odorous discharge (IOD).

mance of the algorithm. Although taking a much older sexual partner (age ≥ 25 years) was associated with a four-fold increased risk of being STI-positive ($P < 0.001$), only 18.4% of schoolgirls had had such a partner (23). Not all adolescent populations will have such low prevalences of STIs and some subgroups (e.g. street girls) could be expected to have a higher STI risk. For such adolescents, more liberal criteria for treating cervical infections might be needed.

Finally, it is important to remember that the performance of any flowchart based on sexual behaviour is closely related to the truthfulness of statements made by the study subjects about their sexual patterns. In this study considerable efforts

were made to win the confidence of the girls. Accuracy in other settings will ultimately depend on careful and sensitive questioning of adolescents by appropriately trained health workers who maintain the confidentiality of their clients. ■

Acknowledgements

This study was funded by the United Kingdom Government Department for International Development. This department accepts no responsibility for any information provided or views expressed in the article.

Conflict of interests: none declared.

Résumé

Algorithme pour la prise en charge des infections sexuellement transmissibles chez des adolescentes au Nigéria

Objectif Mettre au point un algorithme adapté à l'évaluation du risque de trichomonase, de chlamydie et de gonococcie dans une population d'adolescentes qui n'ont pas toutes une expérience sexuelle ou ne sont pas engagées présentement dans une relation.

Méthodes Les données utilisées pour construire l'algorithme proviennent d'enquêtes microbiologiques transversales chez des adolescentes de 14 à 19 ans habitant Port Harcourt (Nigéria). Les différents points de l'algorithme portent sur : i) l'expérience sexuelle ; ii) l'activité sexuelle récente ; iii) un test urinaire positif pour la leucocyte estérase

(LE) ; iv) parmi les adolescentes LE négatives, un antécédent de pertes vaginales nauséabondes ou prurigineuses.

Résultats Parmi l'ensemble des adolescentes examinées, 26,2 % ont reçu un traitement pour une cervicite ou une vaginite ; les affections à *Chlamydia*, à gonocoques et à trichomonas ont été correctement diagnostiquées dans respectivement 37,5 %, 66,7 % et 50 % des cas.

Conclusion Si cet algorithme est mieux adapté à une population d'adolescentes que l'algorithme pour les pertes vaginales utilisé dans les protocoles de prise en charge syndromique, il manque encore de précision et a besoin d'être adapté aux conditions locales.

Resumen

Diagrama para el manejo de las infecciones de transmisión sexual en mujeres adolescentes de Nigeria

Objetivo Elaborar un diagrama adecuado para evaluar el riesgo de tricomoniasis, clamidiasis y gonorrea en una población de mujeres adolescentes, no todas las cuales habían tenido experiencias sexuales o mantenían en ese momento una relación.

Métodos Los datos empleados para elaborar el diagrama se obtuvieron a partir de estudios microbiológicos transversales de muchachas de 14 a 19 años de Port Harcourt (Nigeria). En el diagrama se hace un cribado teniendo en cuenta (i) la experiencia sexual; (ii) la actividad sexual reciente; (iii) la eventual positividad de la prueba de la esterasa leucocitaria (EL) en orina; y (iv), entre los

casos EL-negativos, los antecedentes de flujo maloliente o pruriginoso.

Resultados De todas las adolescentes sometidas a ese cribado, el 26,2% recibieron tratamiento contra una cervicitis o vaginitis, y las infecciones por clamidias, gonococos y tricomonas fueron diagnosticadas correctamente en el 37,5%, 66,7%, y 50% de los casos, respectivamente.

Conclusión Tratándose de una población de adolescentes, el diagrama es preferible al algoritmo para flujo vaginal empleado en los protocolos de manejo sintromico, pero adolece aún de imprecisión y ha de ser adaptado a las condiciones locales.

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