Integrating cervical cancer and genital tract infection screening into mother, child health and family planning clinics in Eldoret, Kenya

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Abstract

Background: Visual inspection, with acetic acid (VIA) and with Lugol's iodine (VILI), has been demonstrated to have test characteristics comparable to those of Pap smear but are more affordable and easier implement. It also presents an opportunity for management of female genital tract infection.

Objectives: Pilot test integration of cervical cancer screening using visual inspection with genital tract infection identification into an existing MCH-FP in MTRH.

Methods: Cross sectional, descriptive study in which consecutive women were screened for genital tract inflammatory morbidity and cervical cancer through visual inspection.

Results: Two hundred and nineteen women with a mean age of 31.3years, parity of 3.1 were screened. About 54% of study participants had multiple sex partners, 62% had sexual debut earlier than 20 years, while use of tobacco was reported by 4%. The test positivity rate was 13.9% and 16.9% for VIA and VILI respectively. Positive test finding was significantly related to contraceptive never-use after controlling for previous screening (p=0.006).Symptoms of genital tract infections were reported by 38% of the participants with features of cervicitis being reported by nearly 24%.

Conclusion: Integration of cervical cancer screening and genital tract infection identification and treatment into the existing MCH-FP appears feasible.

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Introduction

Cervical cancer is the commonest female genital tract cancer seen at the Moi Teaching and Referral Hospital (MTRH). Over 80% of the cases present to care with stage 2B invasive cancer when only palliative care is feasible[1]. Besides, the only radiotherapy facilities in Kenya are located in Nairobi further constraining the access to definitive treatment. This situation is replicated elsewhere in Kenya and the developing world. Cervical cancer is a disease whose etiology and natural history is now well understood. The proximate causative factor is infection with high risk human papilloma virus notably types 16, 18, 33, 45. Other apparent, though somewhat controversial, independent risk factors for development of cervical cancer include use of oral contraceptives, smoking, age of menarche, menopause, sexual debut and number of lifetime sexual partners[2]. In the absence of immunosuppression, the precancerous stages of the disease, represented by low grade squamous intraepithelial lesion (LGSIL) and high grade squamous intraepithelial lesion (HGSIL), follow a predictable course spanning 10 – 15 years during which the disease is confined to the squamous epitheliumand has not breached the basement membrane. Due to the impact of HIV infection on HPV persistence and clearance, women who are co-infected with the two viruses tend to have a more rapid transition from intra-epithelial lesion to invasive cancer[2, 3]. Where routine screening is available, as in developed countries, the condition can be discovered in the precancerous stage when a simple, cheap outpatient procedure, such cryosurgery or loop electro-excision procedure, is curative. Such routine population based screening programs have been demonstrated to significantly reduce the incidence of squamous cell carcinoma of the cervix but have relatively less effect on adenocarcinoma[4]. Pap smear which is the long time mainstay of screening is unavailable, in all but the most opportunistic circumstances in the Kenyan health care system, due to its sophisticated manpower and infrastructure requirements.

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Recently developed simpler approaches using visual inspection with either acetic acid (VIA) or Lugol's iodine(VILI) appear promising and are being adopted in resource challenged settings[5,6]. While the test characteristics of these visual inspection methods are similar to those of cervical cytology (Pap Smear) they carry the advantage of being simple to learn and implement by middle level health workers, they are relatively more affordable, and allow for the screening results to be availed to the woman same day. To further reduce the risk of loss to follow-up of women with positive test results, strategies that enable treatment to be completed during the same visit – the "see and treat" approach have been developed[7].

Cervical cancer screening presents a unique opportunity to also examine the female genitalia for genital tract infection. Currently, these are treated based on symptoms which are grouped as syndromes with clear guidelines on how to recognize and treat each syndrome. The syndromes include: vaginitis, cervicitis, PID, genital ulcer disease. Clinical examination allows identification of cases where there are clinical signs but the patient has no symptoms or does not recognize their significance. Available evidence shows that genital tract infections are fairly common but their identification is hampered by the fact that, especially among female populations, the infections can be quiescent. Even where there are symptoms, women tend to not volunteer the information to health providers unless specifically probed for the symptoms[8]. The MCH-FP clinic is a setting that offers the opportunity for the health provider to add value to the visit for the woman through cervical cancer screening and also identification and treatment of any co-existing genital tract infections. Treatment of such genital tract infections could be beneficial in many ways including a reduction in HIV transmission rates.

We carried out a pilot project to explore the issues related to the possible adoption and implementation of cervical cancer screening by visual inspection at MTRH and its catchment area. In this paper, we report on the characteristics of participants in the pilot project that aimed at integrating cervical cancer screening using visual inspection approaches with identification and treatment of common genital tract infection syndromes in the setting of on-going Maternal and Child Health and Family Planning (MCH-FP) services at MTRH.

Methods

Study design

This was a cross sectional descriptive study with the goal of drawing lessons from the typical programmatic environment in which a broader visual inspection screening program could be implemented.

Setting

The study was carried out between May 2005 and January 2006, at Moi Teaching and Referral Hospital. MTRH is Kenya's second national referral and teaching hospital and is located in the town of Eldoret, in the North Rift Area of Western Kenya. The hospital hosts a Maternal, Child Health and Family Planning (MCH-FP) clinic for reproductive health services including family planning combined with the well baby clinic. Our study population was derived from women accessing this clinic either for well baby services or family planning services. We did not include women seeking antenatal care or immediate postpartum services. Reasons for coming to the clinic (whether for well baby clinic or contraception) were not recorded.

Training for study procedure

Two nurses working in the MCH-FP unit of MTRH were trained on the technique of VIA and VILI using the curriculum developed by Program for Appropriate Technology in Health (PATH) [20]. The training involved three days of didactic training followed by two days reviewing cervigrams incorporating use of VIA and VILI to familiarize the trainees with the interpretation of the gross appearance of the cervix without and with acetic acid or Lugol's iodine applied. The nurses were also trained to recognize clinical features of common genital infections using the same curriculum.

One of the authors (EW) then supervised the trainees on the procedure and interpretation of VIA/VILI using patients coming into the MCH-FP clinic of MTRH. Once deemed competent, the nurses were allowed to continue the pilot project work on clients coming to the hospital for family planning and well baby services.

Study population

The study population consisted of women seen at the MTRH MCH-FP clinic either for family planning services or well baby clinic. Women attending the clinic were invited to participate in a questionnaire survey about previous cervical cancer screening experiences, their perception about risks of

developing cervical cancer and issues related to access to the screening services. The questionnaire survey was conducted by a suitably trained female research assistant who normally did not work at the MCH-FP. The results of the questionnaire survey will be reported in a subsequent paper. Women consenting to participate in the questionnaire survey were invited to have free cervical cancer screening using the visual inspection approaches of VIA and VILI. The women were informed of the various available approaches including VIA and VILI and informed that the latter technique while cheaper than Pap smears was still being evaluated. Those consenting to have VIA/VILI were then subjected to the procedure as part of the pilot project. The project did not offer women Pap Smear test but they were free to access it at a hospital for a prescribed fee, if they so wished. All women attending the MCH-FP clinic were approached and offered the opportunity to participate.

Cervical cancer ccreening procedures

In this study women had both VIA and VILI procedures. Due to the staining characteristics, VILI was performed after VIA.

VIA procedure

With the patientin lithotomy position, the cervix was exposed by use of a single use disposable bivalve speculum. 4% acetic acid was applied to the cervix. One minute later, the cervix was visually inspected, under bright illumination, for the presence of discrete aceto-white lesions near to or abutting the transformation zone. The nurses conducting the screening procedure marked the location of the lesions on a diagram of the cervix for records. Where the squamo-columnar junction could not be clearly identified, the procedure was recorded as incomplete.

VILI procedure

The same activities were carried out as described in the VIA procedure except that instead of applying acetic acid, Lugol's iodine was used. The precancerous lesions appeared as saffron yellow discrete patches in the background of mahogany brown staining normal epithelia, near to or abutting the transformation zone. Again the lesions were documented as described under VIA procedure.

Screening for genital tract infection signs

Apart from the cervical cancer screening procedures, the nurses were required to examine the lower genital tract (vulva, vagina and the cervix) in all participants and record all inflammatory abnormalities including discharges, ulcers and any other evidence of inflammation before embarking on the VIA or VILI procedure. The nurses had been trained to recognize these abnormalities using the PATH manual for visual inspection. No laboratory microbiological evaluations were performed.

Ethical considerations

The study was approved by the ethical committee of MTRH and permission to carry it out granted by the Director of MTRH. Only women providing written consent participated and only de-identified participant information was used for research purposes. The linked screening information was used for referral for follow-up and treatment as needed. All subjects and their partners with clinical evidence suspicious for genital tract infection were offered treatment using the syndromic management protocols in the STI clinics already functional in the hospital.

VIA and VILI positive cases were referred to MTRH Colposcopy clinic for further evaluation. Colposcopically directed cervical punch biopsies were obtained if the abnormal visual inspection findings were still persisting during the visit to the colposcopy clinic. The biopsies were only obtained if the participant gave a separate written consent for the procedure. The tissues were sent for histopathologic examination by the pathologist (NB) in the team. The histopathologic confirmation was further constrained by the fact that patients were expected to pay for the service according to the existing hospital cost-sharing policy. Those with confirmed cervical lesions were referred for definitive management at the MTRH Gynecology clinic.

Data analysis and presentation

Data was entered into an SPSS data base and analyzed by determination of proportions and simple cross-tabulations between variables. Chi-square statistic was calculated for the cross-tabulations, where appropriate, with significance declared at a p-value of <0.05. All the p-values were two sided. Agreement between various VIA and VILI and between clinical signs and presence of genital symptoms was assessed by use of the Kappa statistic and the p-value.

Results

Between June 2005 and January 2006, we invited 435 women accessing the well baby and family planning services at the MCH-FP clinic at MTRH, Eldoret into the project. Of these, 219 women accepted while 216 women declined to participate in the pilot project. The 219 women who accepted to participate form the basis of our paper on the prevalence of abnormal visual inspection findings and on the frequency of genital tract infection.

Table 1 presents the demographic characteristics and occurrence of known risk factors for cervical cancer among study participants.

The participants had a mean of 31.3 years with a standard deviation of 6.8 years. Only 2.3% had not had a child before, while the rest had had at least one child. The mean parity was 3.1 with a standard deviation of 1.9.

The traditional risk factors for development of cervical cancer were observed in a substantial proportion of the study participants. Of note was the large proportion (over 54%) of study participants who on self report had multiple sex partners. While use of tobacco was uncommon at less than 4%, sexual debut earlier than 20 years was rampant reported by nearly 62% of participants. The high rate of contraceptive use was not surprising since this was a selected population derived from the MCH-FP clinic.

Table 1: Demographic characteristics and occurrence of known risk factors for cervical cancer among study participants

Characteristic	Percentage (%)
Age (N = 219)	100
< 30 years	40.6
= or > 30 years	59.4
Parity (N = 218*)*1 missing value	100
Nulliparous(0)	2.3
Multiparous (1 or more)	7.7
Contraception (N = 219)	100
None	18.3
Condoms	1.8
IUCD	26.5
Combined Pill	8.7
Injection	39.7
Implants	3.7
BTL	1.4
Type of Partnership (n = 209) 10 missing data	100
Single	
Monogamous	
Polygamous	
Lifetime Sex Partners (n = 216) 3 missing data	100
1	45.9
2 – 4	49.5
= or >	5 4.6

Table 2 shows the VIA and VILI findings for the participants who accepted visual examination screening. 13.8% of participants had positive VIA results with 0.4% or one participant being suspicious for cancer while 16.9% had positive VILI results with 0.9% or 2 participants with suspicious for cancer. Of the 40 participants who had positive VIA and or VILI, 24 accepted to undergo further evaluation with colposcopic examination. Fourteen of these had negative examination, 6 had low grade squamous intraepithelial lesion (LGSIL) and 3 had high grade squamous intraepithelial lesion. These participants were referred for further evaluation and treatment at the gynecology outpatient clinic of MTRH. The rest of the participants (195) had negative visual examination findings and were thus not invited to undergo colposcopic evaluation. VIA and VILI showed "very good agreement" in identifying abnormal visual inspection findings, Kappa =0.830, p = 0.000.

Table 2: VIA and VILI findings

Procedure	% with specific outcome
VIA (n=216)	100
Negative	85.2
Positive	13.4
Suspicious for cancer	0.4
Incomplete	0.9
VILI (N = 219)	100
Negative	82.2
Positive	16.0
Suspicious for cancer	0.9
Incomplete	0.9
Agreement between VIA and VILI	
Kappa	0.830
p- value	0.000

Table 3 shows that women who had never used contraception were significantly more likely to have a positive visual inspection test result both by VIA and VILI (p=0.03). This relationship remained significant for women who had never had cervical

cancer screening before (p=0.006) while it was not significant for women who had screened for cervical cancer before (p=0.420). Further, significant associations were identified between abnormal visual inspection findings and parity and between abnormal visual inspection findings and age. Unexpectedly, 60% of nulliparous women compared to 12.6% of multiparous women had abnormal visual inspection findings(p=0.002). Similarly, 20.2% of women aged less than 30 years compared to 9.2% of women older than 30 years had abnormal visual inspection findings (p=0.02). The association between age and parity was considered potentially confounded by their individual relationships with visual inspection findings. The relationship between age and VIA finding only remained significant for multiparous women (Fishers Exact 4.904, p=0.035) while it disappeared for nulliparous women (Fisher's Exact 0.667, p=1.00).

Table 3: Relationship between visual inspection findings and selected risk factors

Independent variable	Dependent variable VIA results (similar trends observed for VILI results)			
	Negative	Positive	Total	**Statistic**
Contraceptive ever-use (N=219)				
No	72.5%	27.5%	40(100.0%)	X^2 4.8, 1 df, p=0.03*
Yes	86.6%	13.4%	179(100.0%)	
Tobacco Use (N=219)				
No	85.8%	14.2%	211(100%)	X^2 1.3 1 df, P=0.251
Yes	100%	0%	8(100%)	
Parity (N=218)				
Nulliparous	40.0%	60.0%	5(100%)	Fisher's Exact Test 9.23,
Parous	87.4%	12.6%	213(100%)	p=0.002)**
Age (N=219)				
<30 years	79.8%	20.2%	89(100%)	X^2 5.4, 1 df, p =0.02**
> 30 years	90.8%	9.2%	130(100%)	
Lifetime Sex Partners (N=216)				
1	89.9%	10.1%	99(100%)	X^2 1.98 ,1 df, p=0.16
2 or more	83.3%	16.7%	117(100%)	
Age at Coital Debut (N=218)				
20 years and over	84.3%	15.7%	84 (100%)	X^2 1.14, 1 df,p=0.286
19 years or younger	89.4%	10.6%	134(100%)	

***** The relationship remained significant only for those who who had never screened before p=0.006 while it was not significant for those who had screened p=0.420.

** The relationship remained significant for multiparous women (p=0.035) while it was not for nulliparous women (p=1.00).

Table 4 shows that about 38% of the participants had genital tract symptoms. The commonest genital complaint was vaginal discharge and abdominal pains reported by 23.6%. When the participants were examined, signs related to STIs were identified in about 22% of all participants. The commonest sign recorded was evidence of cervical inflammation – cervicitis. There was "fair agreement" between clinical examination findings for genital tract infections and genital complaints for the same, Kappa =0.281, p=0.000.

Table 4: Genital tract complaints and signs

	% with criteria
Genital Tract Symptoms (n = 191*)	100
None	62.3
Vaginal discharge and abdominal pain	23.6

continuation of table 4

	% with criteria
Genital Ulcer	1.0
Vaginal discharge and itchiness	7.3
Bleeding and abdominal pain	4.7
Painful micturition	1.0
**28 missing data*	
Genital Tract Sign (n = 218*)	100
No STI signs	78.0
GUD	4.6
Cervicitis	14.2
Vaginitis	3.2
**1 missing data*	
Agreement between genital symptoms and genital signs	
Kappa	0.281
	p- value 0.000

Discussion

We examined the feasibility of integrating the cervical cancer screening, using VIA and VILI, and clinical evaluation of participants for genital tract infections into existing MCH-FP services at MTRH. The participants were drawn from a population that was sexually active. However, it is significant that 54% of the women reported having more than 1 life time sex partners. Given the likelihood of social desirability bias in self reports, it is conceivable that the true figures are much higher and therefore this was a population with a critical risk factor for development of, not only cervical cancer, but also of acquisition of other genital tract infections, including HIV. This was even more significant given a very low rate of self reported condom ever-use of less than 2%. Another participant risk factor of interest was the age at sexual debut. Up to 62% of the participants had commenced sexual activity before the age of 20 years. The early sex debut may in itself lead to multiple partners before the woman is married. Smoking was an uncommon independent risk factor for cervical cancer observed in this study population. There is evidence to suggest that demographic and lifestyle related risk factor profiles are correlated with risk of high grade intraepithelial lesions to a degree comparable to use of molecular hybridization assays for HPV screening and may be a simple and economical alternative[9]. The finding, in our project, of a significant relationship between positive visual inspection findings and contraceptive never-use and lack of previous screening suggests that targeting screening naïve women might lead to a high yield of abnormal cervical findings. We also found a significant relationship between multiparity and positive VIA findings after controlling for age. Taken together, these significant relationships suggest that women, who were multiparous, perhaps due to contraceptive never-use, were more likely to have positive VIA findings if they were younger than 30 years and had not had any previous screening. This observation is driven, first, by the fact that younger women were less likely to have previously screened compared to over 30 year olds (18.5% vs 81.5% of those reporting previous screening X^2 6.247 p=0.012 (data not presented). Secondly, younger and multiparous women are likely to have been sexually active earlier and hence at higher risk.

We found a VIA test positivity rate of 13.8% while VILI test positivity rate was slightly higher at nearly 17%. There was "very good agreement" between the two screening methods. These figures are comparable with those reported in other studies that showed VIA positive rate of 13.2% in Ghana[7] and VIA positive rate of 16.1% and VILI positive rate of 16.4% for pooled data of five African country studies and one Indian study involving 56,939 women 25 – 65 years[10]. It is recognized that while VIA and VILI have high sensitivity for identifying both low and high grade squamous intraepithelial lesions, they are relatively less specific, compared to cytology, and hence, ideally, there is need for confirmatory testing[10,11,12]. Colposcopic examination and directed biopsies for confirmation of VIA or VILI positive lesions is constrained by lack of infrastructure, personnel, cost of the procedure and fear of the procedure by patients. We only offered colposcopic evaluation to participants with positive visual inspection results as it was not our goal to assess the VIA or VILI test validity in this project[13]. Only 60% (24 of 40) of the participants accepted to undergo colposcopy. Of the 24 participants accepting colposcopy, 9 (37.5%) had squamous intraepithelial lesions – 6 LGSILs and 3 HGSILs. Colposcopic evaluation and directed biopsy was further constrained by low acceptance of biopsy procedure to obtain tissue for the confirmatory histopathological evaluation. Due to the significant attrition in the diagnostic cascade, a one stop strategy of "see and treat" has been recommended for the resource challenged environment[7,11]. Based on our experience, we are convinced that the "see and treat" strategywould be the rational approach for our setting.

We also examined the possibility of integrating genital tract infection management into the cervical cancer screening program. Based on participant complaints, vaginal discharge and low abdominal pain were the most common complaints among the women accepting the screening service. This was reported by nearly 24% of women. The overall frequency of complaints attributable to genital tract infection was about 38%. When the women were examined, the commonest clinical impression attributable to genital tract infection was cervicitis, identified in 14%, while the overall frequency of clinically identifiable genital tract infection was 22%. The clinical finding of a predominance of cervicitis is consistent with vaginal discharge and low abdominal pain as the preponderant participant complaint. Participant complaints appeared to be suggestive of genital tract infection slightly more frequently than clinical impression. There was, however, a "fair agreement"

between the genital complains and clinical findings (Kappa 0.281). This suggests that women with genital signs were asymptomatic, a finding in consonance with a high rate of subclinical infections previously reported in a Tanzanian study[14]. The glaring limitation of the study in this area was that no microbiological confirmation of clinically suspected genital tract infection was carried out. None the less, these findingare comparable with those from a study in India that reported genital tract morbidity, specifically, pelvic inflammatory disease in nearly 25% of women while STIs accounted for about 10% of the morbidity. Mucopurulent cervicitis and bacterial vaginosis were the commonest conditions identified through laboratory evaluation[15,16]. Cervicitis is a common finding in cases misclassified as a positive visual inspection finding. However, in our study, none of the cases of cervicitis were found to be either VIA or VILI positive.

It is clear that by including content related to recognition of clinical features of genital tract infections including STIs in the training on visual inspection procedures for cervical cancer screening, health workers can be empowered to identify and avail treatment for genital tract infections as part of an integrated reproductive health service to women in MCH-FP settings. At the service delivery or technical level, the integration appears feasible. It is recognized that there are substantial policy, and established vertical program demands in terms of reporting and manpower issues that constrain implementation of integration in programmatic settings

Conclusion

Integration of cervical cancer screening and genital tract infection identification and treatment into the existing MCH-FP appears feasible.

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References

1. Were EO, Buziba NG. Presentation and health care seeking behaviour of patients with cervical cancer seen at Moi Teaching and Referral Hospital, Eldoret, Kenya. East Afr Med J. 2001 Feb;78(2):55-9.
2. Syrjanen K. New concepts on risk factors of HPV and novel screening strategies for cervical cancer precursors. Eur J Gynaecol Oncol. 2008;29(3):205-21.
3. Branca M, Costa S, Mariani L, Sesti F, Agarossi A, di Carlo A, et al. Assessment of risk factors and human papillomavirus (HPV) related pathogenetic mechanisms of CIN in HIV-positive and HIV-negative women. Study design and baseline data of the HPV-PathogenISS study. Eur J Gynaecol Oncol. 2004;25(6):689-98.
4. Sigurdsson K, Sigvaldason H. Effectiveness of cervical cancer screening in Iceland, 1964-2002: a study on trends in incidence and mortality and the effect of risk factors. Acta Obstet Gynecol Scand. 2006;85(3):343-9.
5. Sodhani P, Gupta S, Sharma JK, Parashari A, Halder K, Singh V, et al. Test characteristics of various screening modalities for cervical cancer: a feasibility study to develop an alternative strategy for resource-limited settings. Cytopathology. 2006 Dec;17(6):348-52.
6. Arbyn M, Sankaranarayanan R, Muwonge R, Keita N, Dolo A, Mbalawa CG, et al. Pooled analysis of the accuracy of five cervical cancer screening tests assessed in eleven studies in Africa and India. Int J Cancer. 2008 Jul 1;123(1):153-60.
7. Blumenthal PD, Gaffikin L, Deganus S, Lewis R, Emerson M, Adadevoh S. Cervical cancer prevention: safety, acceptability, and feasibility of a single-visit approach in Accra, Ghana. Am J Obstet Gynecol. 2007 Apr;196(4):407 e1-8; discussion e8-9.
8. Bhatti LI, Fikree FF. Health-seeking behavior of Karachi women with reproductive tract infections. Soc Sci Med. 2002 Jan;54(1):105-17.
9. Sideri M, Spinaci L, Schettino F, Mezzetti M, Robertson C, Spolti N, et al. Risk factors for high-grade cervical intraepithelial neoplasia in patients with mild cytological dyskaryosis: human papillomavirus testing versus multivariate tree analysis of demographic data. Cancer Epidemiol Biomarkers Prev. 1998 Mar;7(3):237-41.
10. Sankaranarayanan R, Basu P, Wesley RS, Mahe C, Keita N, Mbalawa CC, et al. Accuracy of visual screening for cervical neoplasia: Results from an IARC multicentre study in India and Africa. Int J Cancer. 2004 Jul 20;110(6):907-13.
11. Palanuwong B. Alternative cervical cancer prevention in low-resource settings: Experiences of visual inspection by acetic acid with single-

visit approach in the first five provinces of Thailand. Aust N Z J Obstet Gynaecol. 2007 Feb;47(1):54-60.
12. Naud P, Matos J, Hammes L, Prolla J, Schwartsmann G, Vetorazzi J, et al. Cervical Cancer Screening in Porto Alegre, Brazil: Alternative Methods for Detecting Cancer Precursors in a Developing Country. J Low Genit Tract Dis. 2001 Jan;5(1):24-8.
13. Gaffikin L, McGrath J, Arbyn M, Blumenthal PD. Avoiding verification bias in screening test evaluation in resource poor settings: a case study from Zimbabwe. Clin Trials. 2008;5(5):496-503.
14. Msuya SE, Mbizvo E, Stray-Pedersen B, Sundby J, Sam NE, Hussain A. Reproductive tract infections among women attending primary health care facilities in Moshi, Tanzania. East Afr Med J. 2002 Jan;79(1):16-21.
15. Bhatia JC, Cleland J, Bhagavan L, Rao NS. Levels and determinants of gynecological morbidity in a district of south India. Stud Fam Plann. 1997 Jun;28(2):95-103.
16. Mwakagile D, Swai AB, Sandstrom E, Urassa E, Biberfeld G, Mhalu FS. High frequency of sexually transmitted diseases among pregnant women in Dar es Salaam, Tanzania: need for intervention. East Afr Med J. 1996 Oct;73(10):675-8.
17. Mayhew S. Integrating MCH/FP and STD/HIV services: current debates and future directions. Health Policy Plan. 1996 Dec;11(4):339-53.
18. Lush L, Walt G, Cleland J, Mayhew S. The role of MCH and family planning services in HIV/STD control: is integration the answer? Afr J Reprod Health. 2001 Dec;5(3):29-46.
19. Grosskurth H, Mosha F, Todd J, Mwijarubi E, Klokke A, Senkoro K, et al. Impact of improved treatment of sexually transmitted diseases on HIV infection in rural Tanzania: randomised controlled trial. Lancet. 1995 Aug 26;346(8974):530-6.
20. Sellors J, Camacho Carr K, Bingham A, Winkler J. *Course in Visual Methods for Cervical Cancer Screening: Visual Inspection With Acetic Acid and Lugol's Iodine*. Seattle, WA: PATH;2004.

Anaemia in pregnancy: associations with parity, abortions and child spacing in primary healthcare clinic attendees in Trinidad and Tobago

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Abstract

Objective: To determine the prevalence of anaemia in antenatal clinic attendees; to investigate the effects of parity, age, gravidity, previous abortions, child spacing and other factors on the prevalence of anaemia in pregnancy.

Methods: This was a retrospective and cross-sectional study. Antenatal records of 2287 pregnant women attending 40 public healthcare centres from January 2000 to December 2005 in Trinidad and Tobago were used. Data pertaining to the investigated variables were recorded. The national prevalence of anaemia was calculated and chi-square tests, odds ratios and logistic regression were used to assess the relationship between anaemia and each variable.

Results: The prevalence of anaemia was 15.3% (95% CI 13.4%, 16.6%). No significant difference in the prevalence of anaemia was found among the different clinics or counties. At the first haemoglobin reading, age was inversely related to the presence of anaemia, whereas gestational age at first visit was directly related. At the final haemoglobin reading, parity, gravidity, and previous spontaneous abortions were directly related to the prevalence of anaemia, while the number of visits was inversely related. Age was inversely associated to the severity of anaemia while gravidity was directly related.

Conclusion: The prevalence of anaemia decreased by 18.7% from 1967. Despite this positive indication, women under 24 years and those commencing antenatal care after the first trimester are still at a higher risk for developing anaemia. Early commencement of antenatal care and close monitoring of the risk groups identified should be strongly advocated.

Keywords: Anaemia, Pregnancy, Prevalence, Risk factors, Trinidad and Tobago

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Introduction

Pregnancy is a period of drastic physiological change which places extreme stress on various systems of the body. Approximately 51% of pregnant women are anaemic before delivery[1]. Anaemia in pregnancy has a multifactorial aetiology[2] and has been found to be associated with a higher risk of prolonged labour, abnormal delivery and low birth weight[3].

The World Health Organization identifies anaemia in pregnancy as a haemoglobin (Hb) reading of < 11.0 g/dl. However, an Hb reading of < 10.0 g/dl is the level widely utilized at health centres throughout Trinidad. Additionally, it is the point at which a patient is likely to become symptomatic and at which therapeutic intervention becomes critical[4].

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Records from the public healthcare centres were used since the majority of the births in Trinidad and Tobago (86.5%, Central Statistical Office (CSO) 2000), occur in the public healthcare system. Thus, trends found can be applied to the majority of the pregnant population of the country.

The last study of anaemia in pregnancy in Trinidad and Tobago was conducted forty years ago by Chopra *et al* who identified a prevalence of 34%[5]. This present study sought not only to update this prevalence but to also identify the risk factors for anaemia in pregnancy and assess the degree to which certain risk factors contribute to this condition.

Methods

For this retrospective cross-sectional study the target population was antenatal patients in the primary healthcare system in Trinidad and Tobago during the period January 2000 to December 2005. Those with first haemoglobin estimations after the end of the second trimester were excluded.

A multistage sampling method was used to represent the distribution of the pregnant population of women in the public health system in Trinidad. Forty

clinics were randomly selected across the eight Community Health districts. The number of health centres sampled in each county reflected the countrywide distribution of clinics by county. The sample was also representative of the urban and rural (CSO definition, 2000) distribution of health centres in each county. Furthermore, in each county the quantity of records sampled was representative of the national proportion of antenatal attendees. Records were then divided based on the urban to rural record ratio within the county. Within the urban and rural classifications the records were equally distributed. No further weighting proportions were done as populations within a given clinic classification were considered to be similar. Finally, equal numbers of antenatal records were taken from each year. A sample size of 2117 was calculated (95% CI; w = 0.03; prevalence of anaemia, p = 14.5%). The actual sample collected was 2287 records.

The variables recorded and analyzed were Hb and PCV levels, age, county, child spacing, date and gestational age at: first visit, Hb and PCV readings, and the number of: clinic visits, pregnancies, abortions and living children. Potential confounders considered included race, socioeconomic status, chronic infections, chronic renal disease, bleeding or haemoglobin disorders, eating disorders, dietary differences, substance abuse, private clinic visits and gestational age at prior abortion. These variables as well as demographic data concerning marital status, occupation and religion were not consistently available in the records.

Analysis was done using Statistical Package for Social Sciences v. 15.0. Variables were investigated for their association with the presence and grade of anaemia. In order to assess the degree of anaemia among anaemic persons for the variables investigated, grades of anaemia were statistically classified as: Grade I: 9.0-9.9 g/dL; Grade II: 8.0-8.9 g/dL; Grade III: d" 7.9 g/dL. Means, standard deviations, chi-square tests (á = 0.05) and odds ratios were calculated. Where relationships were found, a backward stepwise method was used to perform a binary logistic regression for the presence of anaemia.

Results

There were 350 cases of anaemia at the first Hb reading (Grade I: 64.3%; Grade II: 25.4%; Grade III: 10.3%). The prevalence of anaemia at the first Hb reading, i.e. the national prevalence, was 15.3 % (95% CI 13.4%, 16.6%). At the final Hb reading, the prevalence was 20.9 % (95% CI 18.4%, 23.4%). The annual prevalence of anaemia at the first Hb reading did not vary significantly (p= 0.484). The mean (SD) of the first Hb reading was 11.3 g/dL (1.5). In the model as shown in Table 1, the first Hb reading and the gestational age at first visit were useful predictors for the development of anaemia by the final Hb reading. Only 46% of the sample had final Hb readings, with a mean (SD) of 11.0 g/dL (1.4). Twelve percent of the women who were not anaemic at admission developed anaemia. Of those initially diagnosed with anaemia, 195 cases (55%) had subsequent Hb readings. One hundred and thirteen (58%) of these remained anaemic at their final Hb reading. It was more likely to resolve anaemia than to develop it by the final blood profile (OR 5.17 95% CI 3.64, 7.33).

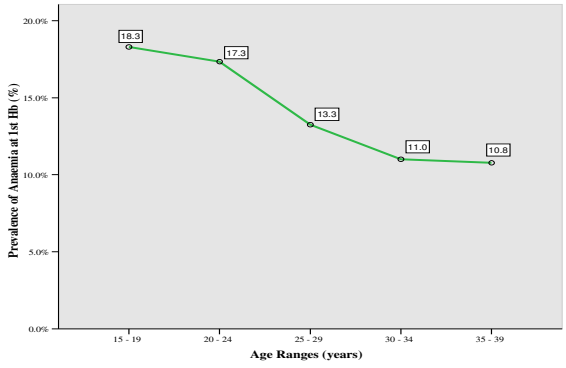
Table 1: Logistic regression of the presence of anaemia at the final haemoglobin reading

	Presence of Anaemia at Final Hb	
	B (95% CI)	P
Constant	18.322	
Gestational Age at 1st Visit	- 0.143	0.124
1st Hb Reading	- 1.64	0.000

B = regression coefficient CI = confidence interval
Nagelkerke R Square = 0.640

The county or clinic type (urban or rural) did not affect the presence or grade of anaemia. Nariva/ Mayaro County had the highest prevalence of anaemia whereas St. George East County had the lowest (22.3% (95% CI 14.8%, 29.8%); and 12.9% (95% CI 9.0%, 16.8%)). The prevalence of anaemia in rural and urban clinics was 17.4% (95% CI 14.1%, 20.7%) and 14.7% (95% CI 13.0%, 16.3%) respectively. The mean age of women for this study was 24.8 years (95% CI 24.6-25.0). The prevalence of anaemia at the first Hb reading decreased with age as indicated in Figure 1.

Figure 1: The Variation in the Prevalence of Anaemia over Age Ranges



At the first Hb reading, there was no significant difference between the prevalence of anaemia in women aged 15-19 and 20-24 (p = 0.608), but women in each of these age groups were more likely to have anaemia than 30-34 year olds. However, the grade of anaemia increased with age at the first Hb. 30-34 year olds were more likely to have Grades II to III anaemia at the first Hb reading than 20-24 year olds.

These associations were maintained when controlled for parity and/or gravidity. Parity had a mean of 1.0 birth (95% CI 0.9, 1.1). At the final Hb reading parous women were more likely to have anaemia than nulliparous women. At both Hb readings, the grade of anaemia increased with parity. An anaemic woman with at least one previous birth was more likely to have Grades II to III anaemia, than a nulliparous anaemic woman at first and final Hb readings. Gravidity had a mean of 1.4 (95% CI 1.3, 1.5). At the final Hb reading the presence of anaemia increased with gravidity such that a multigravid or grand multigravid woman was more likely to be anaemic than a primigravid or secundigravid woman. The mean child spacing was 57.3 months (95% CI 54.9, 59.6). At the first Hb reading, the mean child spacing for anaemics was about 11 months less than that for non-anaemics [46.7 months (95% CI 41.2, 52.3) and 58.2 months (95% CI 55.2, 61.3)]

Child spacing was not associated with the presence or grades of anaemia at the first (p = 0.500; p = 0.870) or final Hb readings (p = 0.196; p = 0.303).

Of the 618 abortions studied, 55% were spontaneous and 45% induced. The presence of anaemia at the first Hb reading was not associated with spontaneous (p = 0.119) or induced abortions (p = 0.312). No association existed between the presence of anaemia at final Hb and induced abortions (p = 0.400). However, at final Hb reading persons with 2-3 spontaneous abortions were more likely to have anaemia than those who had one. Furthermore, presence of anaemia was not significantly different between persons who had no spontaneous abortions and those who had one (p = 0.963).

The gestational age at first visit was inversely related to the presence of anaemia at the first Hb reading. Women whose first visit was during the second trimester (60.8%) were more likely to be anaemic at the first Hb reading than those who had their first visit during the first trimester (39.2%)

The mean number of clinic visits was 7.9 (95% CI 7.8, 8.0). The presence of anaemia at final Hb reading decreased with the number of visits. At the final Hb reading, a woman with 5 or fewer visits was more likely to have anaemia than a woman with 6–10 as shown in Table 2.

Table 2: The impact of the investigated variables on the prevalence and grade anaemia

Variables	Initial Hb Reading							Final Hb Reading						
	Total	Prevalence Within Range	Anemics / Total Anemics	Odds Ratio (95% CI)	Grade I	Grades II/III	Odds Ratio (95% CI)	Total	Prevalence Within Range	Anemics / Total Anemics	Odds Ratio (95% CI)	Grade I	Grades II/III	Odds Ratio (95% CI)
Age														
≤ 14	2	0 (0.0%)	0.0%		0	0		0	0			0	0	
15 - 19	427	79 (18.5%)	22.6%	1.8 (1.2-2.8)	52	27		199	54 (27.1%)	24.8%		30	24	
20 - 24	825	143 (17.3%)	40.9%	1.7(1.1-2.5) 2.7(1.4-5.2)$_a$ 3.9(2.0-7.7)$_b$	94	49	Reff(1)	388	75 (19.3%)	34.4%		48	27	
25 - 29	566	75 (13.3%)	21.4%		53	22		246	46 (18.7%)	21.1%		34	12	
30 - 34	300	33 (11.0%)	9.4%	Reff(1), Reff$_a$(1), Reff$_b$ (1)	14	19	2.6 (1.2-5.6)	145	27 (18.6%)	12.4%		17	10	
35 - 39	146	15 (10.3%)	4.3%		9	6		56	13 (23.2%)	6.0%		7	6	
40 - 44	20	5 (25.0%)	1.4%		3	2		6	2 (33.3%)	0.9%		1	1	
≥ 45	1	0 (0.0%)	0.0%		0	0		1	1 (100.0%)	0.4%		1	0	
Total	2287	350 (15.3%)			225	125		1041	218			138	80	
Parity														
0	1092	164 (15.0%)	46.9%		109	55	Reff(1)	503	84 (16.7%)	38.5%	Reff(1)	62	22	Reff(1)
≥ 1	1195	186 (15.7%)	53.1%		116	70	3.2(1.3-7.6)	538	134 (24.9%)	61.5%	1.7 (1.2-2.3)	76	58	2.2 (1.2-3.9)
Total	2287	350			225	125		1041	218			138	80	
Gravidity														
≤ 2	1443	221 (15.3%)	63.1%		147	78		654	119 (18.2%)	54.6%		82	37	Reff(1)
> 2	844	129 (15.3%)	36.9%		74	51		387	99 (25.6%)	45.4%		56	43	1.6 (1.1-2.1)
Total	2287	350			221	129		1041	218			138	80	
Child Spacing														
≤ 24	250	43 (17.2%)	23.4%		27	18		104	31 (29.8%)	23.8%		15	16	
≥ 25	913	141 (15.4%)	76.6%		88	51		418	99 (23.7%)	76.2%		59	40	
Total	1163	184			115	69		522	130			74	56	
Abortions Spontaneous														
0	2027	319 (15.7%)	91.1%		210	109		934	191 (20.4%)	87.6%		121	70	
1	203	27 (13.3%)	7.7%		12	15		84	17 (20.2%)	7.8%	Reff(1)	12	5	
2 - 3	52	4 (7.7%)	1.2%		3	1		22	10 (45.5%)	4.6%	3.3 (1.2-8.9)	5	5	
≥ 4	5	0 (.0%)			0	0		1	0 (.0%)	0.0%		0	0	
Total	2287	350			225	125		1041	218			138	80	
Abortions Induced														
0	2079	322 (15.5%)	92.0%		209	113		957	204 (21.3%)	93.6%		131	73	
1	163	21 (12.9%)	6.0%		11	10		67	10 (14.9%)	4.6%		5	5	
2 - 3	38	7 (18.4%)	2.0%		5	2		16	4 (25.0%)	1.8%		2	2	
≥ 4	7	0 (.0%)	0.0%		0	0		1	0 (.0%)	0.0%		0	0	
Total	2287	350			225	125		1041	218			138	80	
No. of Visits														
≤ 5								63	23 (36.5%)	10.6%	2.2 (1.3-3.8)	10	13	
6 - 10								626	131 (20.9%)	60.1%	Reff(1)	81	50	
11 - 15								333	57 (17.1%)	26.1%		43	14	
≥ 16								19	7 (36.8%)	3.2%		4	3	
Total								1041	218			138	80	
Gest Age 1st Visit														
≤ 13	896	(11.2%) 100	28.6%	Reff(1)	61	27		383	88 (23.0%)	40.4%		54	34	
14 - 26	1391	(18.0%) 250	71.4%	1.7 (1.4 - 2.2)	164	98		658	130 (19.8%)	59.6%		84	46	
Total	2287	350			225	125		1041	218			138	80	
Urban/Rural														
Urban	1770	(14.7%) 260	74.3%		166	94		751	152 (20.2%)	69.7%		93	59	
Rural	517	(17.4%) 90	25.7%		59	31		290	66 (22.8%)	30.3%		45	21	
Total	2287	350			225	125		1041	218			138	80	

a = multiparous
b = multigravid

Discussion

The prevalence of anaemia in pregnancy in women attending primary healthcare centres in Trinidad and Tobago (January 2000 to December 2005) was 15.3% (95% CI 13.4%, 16.6%). This prevalence decreased by 18.7% from the 34% reported in 1967 by Chopra et al[5] and can be attributed to advancements in the quality of antenatal care and living conditions. Further research would be required to identify aetiology.

It was more likely to find 15-19 or 20-24 year olds with anaemia at the first Hb reading than 30-34 year olds. Likewise, studies conducted in the United States of America (2005) have alluded to an inverse relationship between age and anaemic status up to the age of 35[6]. Conversely, women of all ages were equally susceptible to anaemia in pregnancy by the final Hb reading, as no association was found between age and final anaemic status.

At the final Hb reading, it was found that women with at least one previous birth or pregnancy were more likely to have anaemia than women without any. This suggests that the behaviours and attitudes of pregnant women with children may differ significantly from those of nulliparous women with respect to the current pregnancy. However, no association was found between the prevalence of anaemia at the first Hb reading and parity or gravidity, contrary to the findings of a 1993 South-western Ethiopia study[7].

No association was found between child spacing and the prevalence of anaemia. Analysis may have been affected by the limited cases with child spacing of less than two years. However, a study in Westmoreland Jamaica (1999) identified child spacing of less than two years as a major factor associated with anaemia in pregnancy[8]. Further research is required to investigate this relationship in Trinidad and Tobago.

Abortion did not affect the prevalence of anaemia. This finding was comparable to a 1979 study in India[9]. The social stigma attached to abortion may have limited the number and/or types of abortions reported. Despite this, there was a positive correlation between the number of spontaneous abortions and the likelihood of developing anaemia at final Hb reading.

Women who made their first visit in the second trimester were 1.7 (95% CI 1.4, 2.2) times more likely to be anaemic (18.0%) than those who made their first visit within the first trimester (11.2%). It has been reported that women who had their first visit within the first trimester demonstrated higher compliance with recommended antenatal care[10]. The present study also found that women with 5 or less antenatal visits were 2.2 (95% CI 1.26, 3.76) times more likely to have anaemia at the final Hb reading as opposed to women who made 6-10 visits. Those with more visits may have had more exposure to antenatal services.

Although, it was more likely to resolve anaemia than to develop it by the final blood profile (OR 5.17 95% CI 3.64, 7.33), only 42% of the anaemic cases were resolved. This suggests the need for reassessment of the current measures for managing anaemia in pregnancy.

Anaemic women with at least one birth were 3.2 (95% CI 1.3, 7.6) times more likely to have Grades II to III anaemia than anaemic nulliparous women. Prior births may deplete maternal iron stores due to the increased nutritional demands of pregnancy and puerperal blood loss[11]. Moreover, 30-34 year olds were 2.6 (95% CI 1.2-5.6) times more likely than 20-24 year olds to have Grades II to III anaemia rather than Grade I. This may be due to the decrease of serum ferritin values with increasing age [12] and the association between low serum ferritin values and iron deficiency[4].

Conclusion and recommendation

The prevalence of anaemia decreased by 18.7% from 1967 when it was 34%.

Despite this positive indication, women under 24 years and those commencing antenatal care after the first trimester are still at a higher risk for developing anaemia.

The benefits of early commencement of antenatal care must be advocated in public health education programmes, since a greater proportion of women coming into antenatal clinics late in their pregnancy presented with anaemia. Emphasis should be placed on younger women since they were particularly at risk. Additionally, more efficient antenatal practices and community partnerships must be fostered in conjunction Government policies to further improve antenatal care.

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References

1. Bergmann R, Gravens-Muller L, Hertwig K, Hinkel J, Andres B, Bergmann K, et al. Iron deficiency is prevalent in a sample of pregnant women at delivery in Germany. *Eur J Obstet Gynecol Reprod Biol* 2002;102 (2):155-60.
2. Thomson J. Anaemia in pregnant women in eastern Caprivi, Namibia. *S Afr Med J* 1997; 87(11):1544-7.
3. Malhotra M, Sharma J, Batra S, Sharma S, MurthyN, Arora R. Maternal and perinatal outcome in varying grades of anemia. *Int J Gynaecol Obstet* 2002; 79 (2):93-100.
4. Pettit J, Moss P, Hoffbrand V. Essential haematology. 4th ed. Oxford: Blackwell Science; 2004.
5. Chopra J, Noe E, Matthew J, Dhein C, Rose J, Cooperman J, et al. Anemia in pregnancy. *American Journal of Public Health* 1967; 57(5):857.
6. Adebisi O, Strayhorn G. Anemia in pregnancy and race in the United States: blacks at risk. *Fam Med* 2005;37(9):655 PubMed -62.
7. Desalegn S. Prevalence of anaemia in pregnancy in Jima town, South-western Ethiopia. *Ethiop Med J* 1993; 31(4):251-8.
8. Creary I. Factors contributing to anaemia in pregnancy in the parish of Westmoreland, Jamaica\, Inez M. Creary.: report submitted in partial fulfilment of Master of Public Health, University of the West Indies, Mona, Jamaica; 1999.
9. Prema K, Ramalakshmi B. Effect of medical termination of pregnancy on haemoglobin status. *Indian J Med Res* 1979;69:605-8 PubMed .
10. Majoko F, Nystrom L, Munjanja S, Mason E, Lindmark G. Relation of parity to pregnancy outcome in a rural community in Zimbabwe. *African Journal of Reproductive Health/La Revue Africaine de la Santé Reproductive* 2004;8(3):198 PubMed -206.
11. Frenkel E, Baker W, Sarode R. Hematological complications in obstetrics, pregnancy, and gynecology: Cambridge University Press.© Cambridge University Press 2006; 2006.
12. Halvorsen R, Flesland O. Pregnancy and iron storage. *Tidsskr Nor Laegeforen* 1990;110(25):3222-4.