Reproductive health, infertility and sexually transmitted infections in Indigenous women in a remote community in the Northern Territory

Abstract

Objective: To investigate markers of reproductive health in a remote Indigenous community in Northern Australia.

Methods: A retrospective, cross-sectional analysis of case notes of 342 women between the ages of 20 and 45 years, living in one community in a remote region of the Northern Territory.

Results: The total rate of current infertility in the community was 26.3%; 8.2% for primary infertility and 18.1% for secondary infertility. An additional 3.3% of women had resolved infertility. Only 43% of the women had sought medical help for the problem. A history of ectopic pregnancy was recorded in 2.6%, stillbirth in 1.8%, miscarriage in 14.3% and neonatal death in 12.3%. Depot steroidal contraception or tubal ligation were used by 50% of the women but 45.9% used no contraception. A history of pelvic inflammatory disease (PID), *T. vaginalis N. gonorrhoeae*, genital *C.trachomatis* infection, syphilis or bacterial vaginosis was noted in 32%, 46%, 27%, 30%, 41% and 9% respectively. Current alcohol consumption was reported in 23% and cigarette smoking in 76%. In multivariate analysis, infertility was strongly associated with PID (adjusted OR 8.5), alcohol consumption (AOR 3.1), *T. vaginalis* (AOR 2.5), *N. gonorrhoeae* (AOR 2.2) and bacterial vaginosis (AOR 2.9).

Conclusion: Reproductive health is poor in this community of Indigenous women, with endemic levels of STDs, PID and tobacco consumption. The absence of barrier contraception (e.g. condoms, diaphragms) has implications for HIV and STD control. Clinical and public health interventions are urgently required but the implementation of these is hindered by a number of structural, social and economic barriers.

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Diseases which may impair female reproductive health disproportionately affect those living in disadvantaged circumstances. The prevalence of STDs in the Indigenous population of the Northern Territory, for example, is many times higher than for the non-Indigenous population,[1] in part, as a result of the poor access to services experienced by many Aboriginal people.[2] Although STDs have immediate effects upon the well being of infected individuals, arguably it is the long term sequelae (e.g. pelvic inflammatory disease (PID), ectopic pregnancy and infertility) that have a greater effect upon the health of the population. The association between infection with some STDs and subsequent infertility is well established[3] but this relationship may not be widely perceived by the potentially affected community. Much of the health promotion relating to STD prevention in the Indigenous population in the last 10 years has been conducted in the context of the threat of HIV, a disease which few Indigenous people in remote areas have had direct experience of at present. Fertility, on the other hand, is a central cultural imperative of many Indigenous communities and, although there is anecdotal evidence to suggest that the rate of infertility in the Indigenous Australian population is high, there have been few formal studies to investigate reproductive health issues in this group. In this paper we present the results of a retrospective, cross-sectional analysis of reproductive health and STDs in a cohort of Aboriginal women living in a remote community in the Northern Territory.

Methods

Permission to undertake the study was obtained from two women's groups in the community, the community president, the Joint Institutional Ethics Committee of the Royal Darwin Hospital and the Menzies School of Health Research and the Southern Cross University Ethics Committee. Both the Joint Institutional Ethics Committee and the Southern Cross University had Aboriginal sub-committees who approved the study.

The study community has an Indigenous population of approximately 2,000 people. Medical records of all living Indigenous women in the community between the ages of 20 and 45, as available on July 1, 1996 at the local health centre, were examined. Information collected included age, alcohol and tobacco consumption, obstetric, medical, surgical and STD history.

Women were classified into one of four fertility groups: i) fertile: women who had been able to conceive within 36 months of unprotected intercourse;[4] ii) primary infertility: women who had never given birth to a live child despite 36 months of unprotected sexual intercourse;[4] iii) secondary infertility: women who had given birth to one or more live children in the past but were now unable to become pregnant after 36 months of unprotected intercourse[4] and iv) resolved infertility: women who had experienced either primary or secondary infertility as per the above definitions, and had since become pregnant either spontaneously or following medical intervention.[5] Analyses were

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performed using these 4 groups and also after classifying women as either fertile or infertile (which included women from the primary, secondary and resolved group).

PID was classified into two main groups: i) probable PID: the presence of lower abdominal pain and cervical motion tenderness on a bimanual vaginal examination, with or without adnexal tenderness, in the absence of signs of a urinary tract infection in a sexually active woman[6] and ii) possible PID: the presence of symptoms consistent with PID but where no bimanual examination was performed. In either group microbiological confirmation of the presence of an STD was seen as supportive evidence but the absence of such confirmation did not exclude the diagnosis. The records were examined to see if the women had ever had a positive blood test for syphilis or positive culture or microscopy for *T. vaginalis*, *N. gonorrhoeae*, *C. trachomatis* or bacterial vaginosis. Subsequent episodes were recorded if there was a record of treatment and presumed cure of an initial episode.

Woman were assigned to the categorical groups of current smoker or alcohol drinker with no attempt made to quantify the consumption of either substance. The data were entered onto an Excel database. Descriptive statistical analyses were performed using Excel and Epi Info.[7] Multivariate analysis was performed on factors which reached statistical significance at the 95% confidence level in univariate analysis using Egret (Statistics and Epidemiological Research Corporation, version 0.26).

Results

A total of 342 records of women between the ages of 20 and 45 in the community were examined. Current census data matched this number. A further 127 records were available but not included in the study as they were for non-Aboriginal women or belonged to women who were visitors to the community.

Baseline characteristics

The mean age for the study population was 30.4 years (95% CI: 29.7-31.1) and the mean weight was 55.4 kilograms (95% CI: 53.8-57) There were no statistically significant differences between the fertility groups with respect to age or body weight. Ninety percent of the population were either married or in a de facto relationship. Both the mean and median number of children were 3 (range 0-9).

Prevalence of infertility

The total rate of current infertility in the community was 26.3% (90/342); 8.2% (28/342) for primary infertility and 18.1% (62/342) for secondary infertility (Table 1). An additional 3.3% (11/342) of women had resolved infertility.

Obstetric history

Table 1 illustrates the obstetric history of women in each of the fertility groups. Statistical analysis was performed after placing the women into either the fertile or infertile category. There were no statistically significant differences between the groups with respect to a history of miscarriage, ectopic pregnancy, neonatal death, stillbirth, caesarean sections or post-partum sepsis. A neonatal death (NND) had been recorded in 42/342 (12.3%) women, and six of these women had had more than one NND: one woman had 4 NND, 1 had 3 NND and 4 women had 2 NND .

Causes of infertility

Fifty-five percent of the women with primary infertility and 37% of those with secondary infertility had sought medical help for the problem.

A definitive aetiology had been recorded for 35% of the infertile women: 15% had either 'hormonal irregularities' identified by blood test, or 'polycystic ovarian syndrome'. Tubal damage thought to be infectious in origin was identified in the other 20%. Of the 11 women with 'resolved' infertility, 6 had become pregnant following tubal surgery, one had become pregnant whilst on clomiphene treatment and the remaining 4 had resolved spontaneously. No cause for infertility was identified in 65% of women but many of these women had had either incomplete or no investigations.

Table 1: Obstetric features in relation to the fertility status of the study population.

		Mean live births (95% CI)	Ectopic pregnancies (%)	Stillbirths (%)	Neonatal death (%)	Miscarriages (%)
1° infertility	Women	0	1 (3.6%)	0	0	2 (7.1%)
(n=28 = 8%)	Episodes		1		3	3
2° infertility	Women	2.2	4 (6.5%)	2 (3.2%)	8 (12.9%)	11 (17.7%)
(n=62 = 18%)	Episodes	(1.9-2.5)	4	3	9	13
Resolved infertility	Women	2.2	0	0	0	2 (18.1%)
(n=11 = 3%)	Episodes	(1.5-2.9)				5
Fertile women	Women	3.7	4 (1.7%)	4 (1.7%)	34 (14.1%)	34 (14.1%)
(n=241 = 70%)	Episodes	(3.5-3.9)	4	5	42	43
All women	Women	3.08	9 (2.6%)	6 (1.8%)	42 (12.3%)	49 (14.3%)
(n=342)	Episodes	(2.88-3.29)	9	8	51	64

Table 2: Prevalence and univariate analysis of key variables associated with fertility status.

		Fertile n = 241	Primary infertility n= 33	Secondary infertility n = 68	All women n = 342	Fertile vs Infertile** Odds Ratio (95%CI)	Chi-square p-value
PID*	Women	42 (17%)	25 (76%)	43 (63%)	110 (32%)	4.2	92.8
	Episodes	58	73	108	239	(3.0-5.9)	<0.001
T. vaginalis	Women	95 (39%)	20 (61%)	44 (65%)	159 (46%)	2.7	16.6
	Episodes	152	34	93	279	(1.6-4.4)	<0.001
N. gonorrhoeae	Women	51 (21%)	13 (39%)	29 (43%)	93 (27%)	2.7	21
	Episodes	64	20	49	133	(1.6-4.5)	<0.001
Bacterial vaginosis	Women	17 (7%)	4 (12%)	11 (16%)	32 (9%)	2.3	5.5
	Episodes	18	4	11	33	(1.1-5.1)	0.06
C. trachomatis	Women	68 (28%)	10 (30%)	26 (38%)	104 (30%)	1.1	2.5
	Episodes	111	11	43	165	(0.8-2.4)	0.28
Syphilis	Women	88 (37%)	26 (79%)	27 (40%)	141 (41%)	1.9	36.1
	Episodes	114	50	50	214	(1.2-3.2)	<0.001
Smoker	Women	177 (73%)	28 (85%)	55 (81%)	260 (76%)	1.7	3.17
						(0.9-3.1)	0.2
Consumes Alcohol	Women	42 (17%)	17 (52%)	21 (31%)	80 (23%)	2.9	21.5
						(1.6-5)	<0.001

Notes:

**includes probable and possible cases of PID*

***women with primary, secondary and resolved infertility are included in the 'infertile' group for this analysis.*

Contraception

The most common method of contraception was tubal ligation (93/342 - 27%) followed by intermittent injectable steroid (Depo Provera^{TM}) (78/342 – 23%). Only 2 women used the oral contraceptive pill. Eight of the 93 (8.6%) women who had undergone tubal ligation had requested reversal of the procedure. No woman had the use of condoms documented as a contraceptive method.

Risk factors for infertility

The recognised risk factors for infertility were cross tabulated with the fertility groups. There were statistically significant differences between the occurrence of PID, *T. vaginalis*, *N. gonorrhoeae*, alcohol consumption and syphilis with the fertility groups in univariate analysis. Bacterial vaginosis was of borderline significance. The results are shown in Table 2. The women from the resolved group were included in either the primary or secondary group (as per their initial diagnosis) to perform the chi-squared analysis.

A multivariate logistic regression model was constructed with infertility as the dependent variable and the significantly associated factors as independent variables. Alcohol consumption and syphilis were considered to be confounders on biological grounds. The recognised risk factors for infertility of C. *trachomatis*, smoking, age, weight, diabetes, polycystic ovarian syndrome and endometriosis did not reach statistical significance in univariate analysis and were not included.

As STDs can be considered to be on the same causal pathway for infertility as PID, two models were constructed, one with either PID or STDs but not both as independent variables. The odds ratios for the STDs are shown in Table 3 and the odds ratio for PID was 8.53 (CI 4.99-14.6).

Table 3: Multivariate logistic regression model showing the adjusted odds ratio for those factors which were significantly associated with infertility in univariate analysis (see text).

	adjusted odds ratio	95% confidence interval	p value
Alcohol consumption	3.14	(1.79-5.50)	<0.001
T. vaginalis	2.50	(1.50-4.17)	<0.001
N. gonorrhoeae	2.18	(1.28-3.73)	0.004
Bacterial vaginosis	2.94	(1.33-6.53)	0.008

Note:

Ratio statistic = 6.9 p = 0.009

The number of episodes of PID and individual episodes of STDs were tabulated against the occurrence of all types of infertility (Table 4). Infertility was seen to significantly increase with the number of attacks of PID or STDs.

Table 4: Percentage of women with infertility following increasing number of episodes of *T. vaginalis*, syphilis, *N. gonorrhoeae*, and PID; (odds ratio in parentheses) chi-squared analysis for linear trend.

Episodes of infection	Percentage of women with infertility (odds ratio) 0	1	2	>2	chi-square (p value)
T. vaginalis	20%	35%	40%	56%	19.8
	(1)	(2.1)	(2.6)	(5.1)	< 0.001
Syphilis	24%	28%	43%	75%	20.6
	(1)	(1.2)	(2.4)	(9.6)	< 0.001
N. gonorrhoeae	24%	38%	55%	78%	22
	(1)	(2)	(4)	(11.3)	< 0.001
PID	15%	46%	68%	89%	65.7
	(1)	(4.9)	(12.4)	(46.8)	< 0.001

Discussion

The design of this cross-sectional study has many limitations: these include the incompleteness of the medical records and investigations, the difficulty of defining infertility and PID in a retrospective survey and the complication of lactational amenorrhoea. Nevertheless, a number of findings illustrate the stark reality of the reproductive health of this population. Perhaps the most notable feature is the prevalence of STDs and the high lifetime risk of PID. It is known that STDs are endemic in women in the remote area of the NT; infection with *T. vaginalis*, *N. gonorrhoeae* and C. *trachomatis* occurs in up to 25%, 17% and 11% respectively.[1] While social disruption and substance abuse undoubtedly contribute to the problem, the endemicity is primarily a result of the combination of the asymptomatic nature of STDs and the long duration of infection of the pathogens in the absence of treatment due to poor access to, and utilisation of health services. The prevalence of STDs in this study is likely to be an underestimate, as the diagnostic methods used at the time have been shown to be insensitive for the three common STDs[8] and specific protocols for the diagnosis of bacterial vaginosis were not employed. Even allowing for this, the life time risk of an STD is extremely high with almost half the women having had at least one episode of *T. vaginalis* or syphilis and close to one third having had *N. gonorrhoeae* or C. *trachomatis*. The effect of T. vaginalis infection on premature rupture of membranes and low birth weight has been demonstrated in other disadvantaged populations.[9] This is possibly an important factor as 12% of Aboriginal births in the Northern Territory are low birth weight, almost double the number of non-Aboriginal low birth weight births.[10]

Studies which report on PID rates are plagued with difficulty[3] – there are many aetiologies of the condition, diagnostic criteria vary between studies, clinical diagnosis of the condition is difficult and the majority of disease is asymptomatic (or relatively silent). Nevertheless, using criteria, which are based on clinical features and supported by laboratory findings,[6] we found that 32% of the total population had a history of an illness consistent with PID at some stage in their life.

PID is a recognised cause of morbidity in the developing world, accounting for up to 40% of gynaecological admissions in sub-Saharan Africa,[11] and is a common reason for gynaecological admission in the Northern Territory.[12] This study suggests a relationship between PID and infertility.

Comparisons of the rate of infertility in this community with other populations are also problematic. The prevalence of infertility can vary from 32% to 6% depending on how restrictive the definition of infertility has been. Several studies have used three years of being at risk of pregnancy if women have breastfed their previous infant.[6] As prolonged breast feeding is almost universal in this community the three year time frame was used. We also chose to sub-stratify the women into primary, secondary and resolved infertility groups. Some studies included the women who fall into the resolved group as infertile and this would make the prevalence in the study population 29.4%. This figure is similar to some areas of sub-Saharan Africa where prevalence levels of up to 30% have been found.[13]

The odds ratio for infertility in women with a past history of PID in this population was 8.5 and rose to 46.8 if a woman had three or more episodes recorded. Secondary prevention of infertility involves the prompt diagnosis and treatment of women with an illness consistent with PID as the risk of sequelae is associated with delay in treatment and with repeat attacks.[6] Unfortunately in a population where one third of the women have already had at least one episode of the condition, the value of secondary prevention may be minimal. Primary prevention must therefore be pursued and this involves concentrating on the cohort of young women entering the sexually active age-group. Programs aimed at reducing the underlying prevalence of STDs in the community must receive priority if the risk of acquiring subsequent PID and infertility is to be effectively diminished. One community based STD control program implemented in the Anagu Pitjantjatjara Lands showed that improving access to and delivery of services can significantly reduce the prevalence of STDs.[14]

Most women who fulfilled the criteria for infertility had not had complete medical investigations although many had presented more than once saying they would like to fall pregnant. This makes interpretation of the cause of infertility problematic and is likely to be a result of a reduced ability to access services. Up to a third of the population will spend at least some part of the year on outstations making it difficult to access the health centre, and many do not like to travel to the regional centre. This situation has improved since the introduction of a specialist outreach service where an obstetrician/gynaecologist travels out to some remote communities on a routine basis. Male infertility was not investigated in this study.

It is noteworthy that tubal ligation (27%) and the injectable steroid, Depo-Provera™ (23%) were the most popular means of contraception and that only 2 women in the study used the oral contraceptive pill and only 4 women had a intrauterine device *insitu*. Condoms and other barrier methods were not documented as being used for contraceptive purposes. The implications for the prevention of STDs by this means are obvious.

The risk of PID is directly related to the underlying prevalence of *N.gonorrhoeae* and *C.trachomatis* in the community. Strategies that aim to control these diseases will reduce the incidence of STD-related PID, but unfortunately, despite significant advances in the available diagnostic technologies[8,15] at present there are still many barriers to be overcome. Many communities do not have both male and female staff and service providers describe a workload that is often times overwhelming.[16]

Infertility was chosen as a topic for investigation following extensive discussions by one of us (SK) with the women in this community. They spoke of their strong cultural beliefs, with one woman saying that 'the most important thing for a woman to do in her life was to have children.' They told stories of women who had been shunned by their husbands when they had not been able to have children. A Senior Aboriginal Health Worker with 27 years experience felt that research which would help the infertile women, or decrease the incidence of infertility in the future, would be very beneficial to this community.

Although only 23% of the women were recorded as consuming any alcohol at the time of the survey, smoking was reported in 76%, clearly indicating the need for augmented health promotion in this area.

The reproductive health of Indigenous women in this community falls well behind that of the mainstream Australian society. While fundamental socio-economic change is a pre-requisite for long term improvement, a number of specific interventions could be introduced immediately. We believe that framing health promotional messages for STDs (and other issues such as smoking and alcohol) in the context of reproductive health is likely to be highly effective. STD check-ups should be integrated into primary health care delivery systems and into antenatal care and be part of regular so-called 'Well-person's' checks. The important treatable STDs (*T. vaginalis*, *N. gonorrhoeae*, *C. trachomatis* and syphilis) should be screened for using the latest, non- or minimally invasive technologies. A diagnosis of PID should be viewed as a medical emergency as the consequences of delayed treatment may be irreversible. Special attention should be made to the provision of male and female staff to ensure utilisation of services.

Local dissemination of the results of this study through education sessions with the Health Centre staff and presentations at the Women's Centre and at locally held 'Women's Weeks' has occurred. This shifted the health focus to factors that affect fertility. Unfortunately this will be at the expense of other programs and, until there is an acknowledgement of the need for extra resource allocation in remote Indigenous communities, this kind of program shifting will continue to occur, with predictable and regrettable health outcomes.

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References

1. Bowden FJ, Paterson BA, Mein J, et al. Estimating the prevalence of Trichomonas vaginalis, Chlamydia trachomatis, Neisseria gonorrhoeae, and human papillomavirus infection in Indigenous women in northern Australia. *Sex Transm Infect* 1999;75(6):431-4.
2. Fairley CK, Bowden FJ, Gay NJ, Paterson BA, Garland SM, Tabrizi SN. Sexually transmitted diseases in disadvantaged Australian communities [letter]. *Jama* 1997;278(2):117-8.
3. Westrom L, Joesoef R, Reynolds G, Hagdu A, Thompson SE. Pelvic inflammatory disease and fertility. A cohort study of 1,844 women with laparoscopically verified disease and 657 control women with normal laparoscopic results. *Sex Transm Dis* 1992;19(4):185-92.
4. Marchbanks PA, Peterson HB, Rubin GL, Wingo PA. Research on infertility: definition makes a difference. The Cancer and Steroid Hormone Study Group. *Am J Epidemiol* 1989;130(2):259-67.
5. Gunnell D, Ewings P. Infertility prevalence, needs assessment and purchasing. *J Pub Health Med* 1994;16:29-35.
6. Cates W, Jr., Rolfs RT, Jr., Aral SO. Sexually transmitted diseases, pelvic inflammatory disease, and infertility: an epidemiologic update. *Epidemiol Rev* 1990;12:199-220.
7. Dean A, Dean J, Colombier D, Brendel K, al. e. *Epi-Info*, version 6:a word processing database and statistics program for epidemiologists on microcomputers. Centers for Disease Control and Prevention, Atlanta, GA, USA. 1994.
8. Tabrizi SN, Paterson B, Fairley CK, Bowden FJ, Garland SM. A self-administered technique for the detection of sexually transmitted diseases in remote communities. *J Infect Dis* 1997;176(1):289-92.
9. Cotch MF, Pastorek JG, 2nd, Nugent RP, et al. Trichomonas vaginalis associated with low birth weight and preterm delivery. The Vaginal Infections and Prematurity Study Group. *Sex Transm Dis* 1997;24(6):353-60.
10. Gladigau PW, Carnegie MA, Measey MA, d'Espaignet ET. Northern Territory Midwives Collection:Mothers and Babies 1998. Territory Health Services, Darwin, NT, Australia. 1999.
11. Kani J, Adler M. Epidemiology of pelvic inflammatory disease. In: Berger GS WL, ed. *Pelvic Inflammatory Disease*. New York: Raven Press, 1992.
12. Mein J, Bowden FJ. A profile of inpatient STD-related pelvic inflammatory disease in the Top End of the Northern Territory of Australia. *Med J Aust* 1997;166(9):464-7.
13. Sciarra J. Infertility: an international health problem. *Int J Gynaecol Obstet* 1994;46:155-63.
14. Miller PJ, Torzillo PJ, Hateley W. Impact of improved diagnosis and treatment on prevalence of gonorrhoea and chlamydial infection in remote Aboriginal communities on Anangu Pitjantjatjara Lands. *Med J Aust* 1999;170(9):429-32.
15. Skov SJ, Miller P, Hateley W, Bastian IB, Davis J, Tait PW. Urinary diagnosis of gonorrhoea and chlamydia in men in remote Aboriginal communities. *Med J Aust* 1997;166(9):468-71.
16. Mills J. Issues which impact on nurses and the delivery of health services in remote areas of the Northern Territory. Remote Area Nurses Working Group. Darwin, NT Department of Health and Community Services 1993.