Health Policy and Planning, 32, 2017, 68–78
doi: 10.1093/heapol/czw099
Advance Access Publication Date: 6 August 2016
Original Article

OXFORD

Incidence and determinants of hysterectomy in a low-income setting in Gujarat, India

Sapna Desai,[1,2,*] Oona MR Campbell,[1] Tara Sinha,[2] Ajay Mahal[3,4] and Simon Cousens[1]

[1]Dept of Infectious Disease Epidemiology, Faculty of Epidemiology and Population Health, London School of Hygiene and Tropical Medicine. Keppel St, London WC1E 7HT, UK, [2]Self Employed Women's Association (SEWA) Health; Chanda Niwas, Nr Ellis Bridge, Ahmedabad 380006, Gujarat India, [3]Nossal Institute for Global Health, University of Melbourne, Carlton VIC 3053, Australia and [4]Monash University, Faculty of Medicine, Nursing and Health Sciences, Monash University, Victoria 3800, Australia.

*Corresponding author. C-9 Maharani Bagh, New Delhi 110065, India. E-mail: sapna.i.desai@gmail.com

Accepted on 5 July 2016

Abstract

Hysterectomy is a leading reason for use of health insurance amongst low-income women in India, but there are limited population-level data available to inform policy. This paper reports on the findings of a mixed-methods study to estimate incidence and identify predictors of hysterectomy in a low-income setting in Gujarat, India. The estimated incidence of hysterectomy, 20.7/1000 woman- years (95% CI: 14.0, 30.8), was considerably higher than reported from other countries, at a relatively low mean age of 36 years. There was strong evidence that among women of reproductive age, those with lower income and at least two children underwent hysterectomy at higher rates. Nearly two-thirds of women undergoing hysterectomy utilized private hospitals, while the remainder used government or other non-profit facilities. Qualitative research suggested that weak sexual and reproductive health services, a widespread perception that the post-reproductive uterus is dispensable and lack of knowledge of side effects have resulted in the normalization of hysterectomy. Hysterectomy appears to be promoted as a first or second-line treatment for menstrual and gynaecological disorders that are actually amenable to less invasive procedures. Most women sought at least two medical opinions prior to hysterectomy, but both public and private providers lacked equipment, skills and motivation to offer alternatives. Profit and training benefits also appeared to play a role in some providers' behaviour. Although women with insecure employment underwent the procedure knowing the financial and physical implications of undergoing a major surgery, the future health and work security afforded by hysterectomy appeared to them to outweigh risks. Findings suggest that sterilization may be associated with an increased risk of hysterectomy, potentially through biological or attitudinal links. Health policy interventions require improved access to sexual and reproductive health services and health education, along with surveillance and medical audits to promote high-quality choices for women through the life cycle.

Keywords: Gynaecological, hysterectomy, India, menstrual, reproductive health, sterilization

Key Messages

- Hysterectomy is a common treatment for gynaecological disorders amongst low-income women in India.
- The relatively low mean age at hysterectomy, 36 years, carries significant implications for women's health.
- The absence of primary treatment for gynaecological disorders, along with attitudes towards the uterus as being dispensable post-childbearing, has resulted in the normalization of hysterectomy.

Introduction

Hysterectomy, the removal of the uterus, is the leading reason for non-obstetric surgery among women in many high-income settings (Spilsbury et al. 2006; Whiteman et al. 2008; Stankiewicz et al. 2014). Medical indications for hysterectomy include fibroids, dysfunctional uterine bleeding, uterine prolapse and chronic pelvic pain (Carlson et al. 1993). Physicians' views on the appropriate use of the procedure diverge widely—contributing to variation in rates, and suspected misuse in some settings (Bernstein et al. 1993; Bickell et al. 1995; Broder et al. 2000; Gimbel et al. 2002). Variations in hysterectomy rates have been associated with women's demographic characteristics such as race, education and socioeconomic status and insurance status, as well as their physician's gender, training and geographical location, suggesting that the procedure is related to the broader social and health system environment as well as to biological risk (Bickell et al. 1994; Palmer et al. 1999; Byles et al. 2000; Dharmalingam et al. 2000; Gimbel et al. 2002; Materia et al. 2002; Einarsson et al. 2010). Further, particularly in settings with a high lifetime risk of hysterectomy—such as the United States where one in three women undergoes the procedure—hysterectomy has been scrutinized and contested as a symbol of a wider culture of unnecessary medical intervention in women's bodies (West and Dranov 1994; Angier 1997; Cloutier-Steele 2003).

The incidence of hysterectomy, like caesarean section, varies between and within countries. An estimated 5.1 women per 1000 women above age 15 underwent hysterectomy in 2004 in the United States, compared to 3.1 per 1000 women in Australia (Whiteman et al. 2008; Hill et al. 2010). Within Germany, incidence varies across states, ranging from 2.1 to 3.6 per 1000 women (Stang et al. 2011). Until recently, research and debate on hysterectomy have largely been limited to high-income settings: there are no published estimates of incidence, and only nine of prevalence in low- and middle-income countries. Community-based research in India, El Salvador and Jordan has reported hysterectomy prevalence estimates of between 1.7 and 9.8% of adult women (Kaur et al. 2004; Shakhatreh 2005; Patel et al. 2006; Ozel et al. 2007; Singh and Arora 2008; Bhasin et al. 2011; Desai et al. 2011; Barghouti et al. 2013; Sarna et al. 2013). While none of these estimates was age standardized, the prevalence of hysterectomy is considerably lower than in high-income countries such as the United States (26.2%), Australia (22.0%) and Ireland (22.2%) (Byles et al. 2000; Ong et al. 2000; Erekson et al. 2009), but closer to prevalence in Taiwan and Singapore (8.8% and 7.5%, respectively) (Hsieh et al. 2008; Lam et al. 2014).

In 2012, media reports in India raised suspicion of increasing misuse of hysterectomy as a routine treatment for gynaecological ailments, particularly in young, premenopausal women (Singh 2012; BBC 2013). Analyses of facility and insurance data suggest that hysterectomy is correlated with profit incentives under the national health insurance scheme and unregulated private health care (Jain and Kataria 2012; OXFAM 2013). Research in Gujarat identified hysterectomy as the leading reason for hospitalization in the prior 6 months among both insured and uninsured women, but the cross-sectional nature of the data prevented comparison with other settings or conclusive findings related to predictors associated with the procedure (Desai et al 2014). A recent study in rural Andhra Pradesh found that hysterectomy, conducted at an average age of 29 years, also included removal of both ovaries (and thereby induced premature menopause) in 59% of cases (Kameswari and Vinjamuri 2013). In response to such findings, two states in India have already restricted publicly funded insurance coverage for hysterectomy in private facilities (Majumdar 2013). Despite widespread media coverage and policy changes regarding insurance, there is limited population-level data on hysterectomy to inform policy. Accordingly, the aim of this paper is to estimate incidence of hysterectomy and identify predictors and the underlying determinants of hysterectomy in a low-income setting in Gujarat, India.

Setting

Gujarat, a state of 60 million people on India's western border, is among India's wealthier states (MOSPI 2015). Health indicators, however, remain close to national averages (IIPS/ORCMacro 2006). The National Rural Health Mission (NRHM), India's flagship health programme to improve rural health infrastructure and human resources, was initiated in 2005, followed by Rashtriya Swasthya Bima Yojana (RSBY), the national health insurance scheme that provides hospitalization coverage up to Rs. 30 000 in public and private hospitals for families with 'below poverty-line' cards. Fifty-seven percent of births in Gujarat occur in health facilities, with institutional birth being more common among higher-income, educated urban women (IIPS 2010). Forty-four percent of currently married women have undergone sterilization by tubal ligation, accounting for 70% of all contraceptive use among reproductive age women. Lower-income women are more likely to utilize sterilization as a contraceptive method, with 85% of sterilized women obtaining the procedure in a government facility (IIPS 2010).

We conducted our study alongside a 2-year evaluation of a community health intervention implemented by the Self-Employed Women's Association (SEWA) in Ahmedabad district and city in Gujarat between 2010 and 2012. SEWA, a trade union of over 1.5 million women workers in the informal economy, works towards members' full employment and self-reliance. It operates a voluntary health insurance scheme (VimoSEWA) that offers coverage for hospitalizations that exceed 24 h. Previous research based at SEWA identified hysterectomy as a leading reason for hospitalization and insurance claims, indicated that it occurred at an average age of 36 and suggested that care provided to women for gynaecological ailments and surgery was of poor quality (Ranson and John 2001; Desai et al. 2014).

Methods

This study utilized two data sources: (i) a quantitative, population-based cohort of adult women and (ii) in-depth qualitative research amongst women, health care providers and key informants. While the quantitative survey could estimate prevalence and incidence and some predictors of hysterectomy, understanding the complexity of social and behavioural factors that influenced women to undergo hysterectomy required integration of a qualitative approach (Creswell and Plano Clark 2007; Lingard et al. 2008). All interview participants reviewed a study information form with researchers and consented to participation and sharing of findings including publication. Identities of all sources were anonymized. The Executive Committee of the SEWA Health Cooperative and the ethics committee of the London School of Hygiene and Tropical Medicine provided ethics approval for the quantitative and qualitative components.

Cohort study

Quantitative data came from four household survey rounds that collected demographic, health and treatment-seeking information in a

cohort of adult women, as part of a 2-year cluster randomized trial to evaluate the effect of a health education intervention designed to reduce insurance claims and hospitalization for diarrhoea, fever and hysterectomy amongst adult women. The trial was conducted in 28 clusters over two years. Seventy households were selected in each cluster, 35 of which were randomly selected from SEWA's insurance membership database. The remaining 35 were randomly selected from household listings. An adult woman over the age of 18 in each household was selected for interview, with no maximum age limit. In insured households, the primary VimoSEWA-insured member was surveyed. No selected households had more than one primary female-insured member. In uninsured households, the primary SEWA member or wife of the male head of household was selected. At the time of recruitment, women were given general information about the study topic but not told about the health education intervention on hysterectomy. Of 1960 households selected, 1934 women were recruited in the first survey round; 26 insured households were excluded due to non-availability of the eligible household or member, with no replacement found. After analysing baseline findings on the prevalence of hysterectomy, we added survey questions pertinent to hysterectomy and reproductive health history to subsequent rounds and decided to initiate a qualitative study to explore individual, social and health systems determinants of hysterectomy, described below.

Analysis of the trial found no evidence of an effect of the intervention on rates of claim submission (RR 1.03; 95% CI 0.81, 1.30; $P = 0.81$) hospitalization (RR 1.05; 95% CI 0.58, 1.90; $P = 0.88$) or morbidity (RR: 1.06, 95% CI 0.87, 1.28; $P = 0.58$) related to diarrhoea, fever and hysterectomy (Desai 2015). Accordingly, a cohort analysis to estimate incidence and identify predictors of hysterectomy included data from both treatment and control areas over all four rounds of the household survey, rather than from non-intervention areas only. Data were entered into a Microsoft Access database and analysed using Stata 11. The svyset command was utilized to account for the cluster sampling and the different sampling fractions for insured and uninsured households across clusters. Two sampling weights, inversely proportional to the sampling fraction, were defined for each cluster: one for insured women and one for uninsured women. All tables except Table 2 present weighted proportions; findings, therefore, represent the study population with respect to health insurance status. Women who reported hysterectomy prior to the period covered by the baseline survey were excluded. The incidence of hysterectomy, based on cases reported by the primary adult respondent over the 2-year survey period, was estimated using the exponent of the Poisson regression coefficient. Crude rate ratios for a range of demographic characteristics such as income, urban/rural location, education, insurance status, number of living children and sterilization history, were estimated using Poisson regression. Wald tests were utilized to obtain P values for variables with more than one level. A multivariable Poisson regression model was fitted to identify predictors of hysterectomy using forward regression, which included variables with crude rate ratios observed to be associated with hysterectomy ($P \leq 0.10$).

Qualitative study

Qualitative fieldwork was conducted in two rural blocks that were also covered by the quantitative study. Participants were identified over time and through interactions in the community, as well as through health workers and referrals from other interviewees, rather than from the survey sample. This approach helped to ensure variation in the length of time that elapsed since women underwent hysterectomy. Women were recruited and interviewed until no new analytical themes emerged. Thirty-five women with previous hysterectomy were interviewed. Five gynaecologists, who had performed the hysterectomy for 20 of these 35 cases, were interviewed along with 16 other key informants who included midwives, health workers and family members. Three women with gynaecological ailments who did not proceed with hysterectomy were identified and interviewed.

Interviews were conducted and transcribed in Gujarati. Findings were coded into primary and sub-themes to identify drivers of hysterectomy. Women were compared across sub-themes and variables in a framework analysis (Desai 2016). Interview content was also specifically analysed to examine if SEWA health insurance affected the decision to undergo hysterectomy.

Table 1. Numbers of women surveyed, by round

	Baseline	Round 2	Round 3	Round 4
Cumulative loss to follow-up	0	73	107	294
Women surveyed	1743	1670	1636	1449

Mixed methods analysis

The mixed methods analysis was both inductive and deductive, combining data in an iterative approach and through using triangulation (O'Cathain et al. 2010). The quantitative cohort data were analysed first to estimate incidence and identify predictors of hysterectomy. The analysis of qualitative data was conducted next to examine processes and determinants. Next, findings from both sets of data were triangulated to identify convergence, dissonance and gaps. New analytical themes in either set of data also led to further analysis in the other. Finally, predictors and underlying determinants were examined together to identify intersections.

Results

Of the 1934 women recruited into the study, 191 women (10% of women interviewed at baseline) had undergone hysterectomy before the period covered by the baseline survey and were excluded from the cohort analysis. Surveyed women contributed 3268 woman-years at risk. Mean follow-up time was 1.9 years. While 94% of women were retained for three rounds, unanticipated slum demolitions and occupation-related migration resulted in higher loss to follow up in the final round. In total, 83% of women were followed up for the full two years (Table 1). Women surveyed were typically low-income women workers of the informal economy, most between the ages of 25 and 44, and married with at least two children (Table 2). Sixty-one percent of women who were surveyed in round four reported having undergone sterilization through tubal ligation, with mean age at time of sterilization of 27.5 years (Figure 1).

Epidemiological findings

Sixty-two women reported undergoing hysterectomy during the two-year study period, an incidence of 20.7 per 1000 woman-years (95% CI: 14.0–30.8 per 1000 woman-years), at a reported mean age of 36.0 years (95% CI: 33.8–36.2). Crude analyses (Table 3) yielded little evidence that hysterectomy rates varied by insurance status, rural or urban location, religion, education, occupation, house type, latrine ownership or perception of one's own health ($P \geq 0.2$ in all cases). The incidence of hysterectomy was highest among women older than 25 and younger than 54 years, and very

Table 2. Overview of study sample at risk of hysterectomy at baseline

Overview of study population	*n* 1743	% (unweighted)
Age group		
<25	132	7.6
25-34	541	31.2
35-44	596	34.4
45-54	359	20.7
55+	115	6.6
Demographic characteristics		
Insured	908	52.4
Rural location	986	56.9
Hindu	1543	89.0
Currently married	1536	88.6
Have 2+ children	1598	92.2
Have undergone sterilization[a]	884	61.0
Never attended school	932	53.7
Agricultural worker	697	40.2
Annual income <Rs. 60 000	790	45.6
Partial mud and solid house	1040	60.0
Report average health	1254	71.9

[a]Data only collected in survey round 4; 294 cases that were lost to follow-up are missing.

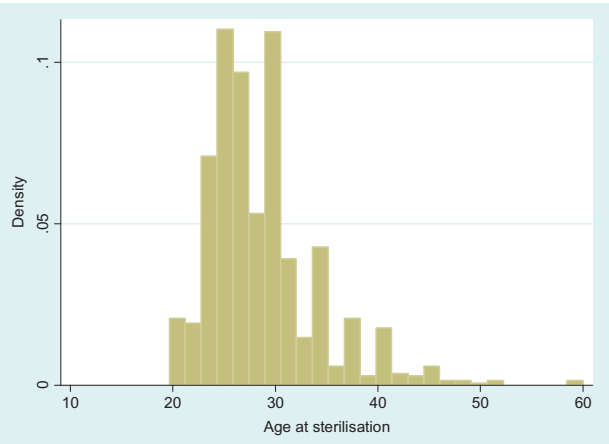

Figure 1. Mean age at sterilization ($n = 884$)

low among women older than 55 (0.06/1000 person-years). There was strong evidence that the incidence of hysterectomy was higher amongst women with relatively lower incomes (RR = 0.12 for annual household income of Rs. 120 000+ compared with those with an income of Rs. 0–60 000; $P = 0.01$). There was also strong evidence that women who have two or more surviving children had a higher rate of hysterectomy than women with fewer children. Further, married women reported higher rates than unmarried (RR = 0.07, 95% CI: 0.01, 0.66) or widowed women (RR = 0.53, 95% CI: 0.08, 3.66; $P = 0.06$). Women who had not been sterilized (RR = 0.41, 95% CI: 0.14, 1.21; $P = 0.09$) reported lower rates of hysterectomy than sterilized women, but evidence for these two associations was relatively weaker.

Multivariable regression (Table 4) indicated strong evidence that the incidence of hysterectomy was independently associated with age, with highest incidence amongst women between 25 and 54 years, with lower income status and with having at least two surviving children. Neither sterilization history nor marital status emerged as independent predictors of hysterectomy incidence when adjusted for number of surviving children, income level and age. There was little evidence of clustering of hysterectomy rates in a random effects model not adjusted for location strata or sampling weights ($P = 0.12$). Nearly two-thirds of women (62%) utilized private hospitals for hysterectomy, while the remainder used government (34%) or non-profit trust hospitals.

Qualitative findings

The 35 women interviewed who had undergone hysterectomy had broadly similar demographic characteristics as women in the cohort study, except for variation in the number of years since the procedure (Table 5). Most women and key informants (health workers, midwives and family members) felt the procedure was normal and increasingly common; all easily recounted cases of others who had undergone the surgery in the surrounding areas. All 35 women reported gynaecological morbidity, typically experienced as severe pain, excessive bleeding and disruption to daily life, as the catalyst for seeking care from a gynaecologist. Two local midwives perceived an increase in menstrual disorders in the area, which they ascribed to use of fertilizers in the soil and dietary changes. They also believed younger women no longer relied on traditional medicines for menstruation-related ailments in particular, as the new generation desired quicker treatment.

The majority of women (27/35) sought at least two medical opinions for gynaecological morbidity, over a period of several weeks or months, during which time they considered the financial, logistical and familial implications of hysterectomy once it was suggested as an option (see Box 1). Slightly more than half of women used private hospitals, while the remainder used government and trust facilities. All except two women were unsure whether their ovaries were removed with the uterus during surgery. Almost all women shouldered debt, a mortgage or other financial difficulties to finance treatment and surgery.

Women's experiences and attitudes regarding hysterectomy were categorized along a spectrum—last resort, pragmatic treatment/prophylaxis or permanent freedom—based on their reproductive health history, treatment-seeking patterns and representations of hysterectomy (Table 6). While attitudes toward hysterectomy did not appear to be linked to observable socioeconomic or demographic characteristics, history of previous sterilization appeared to be linked to women's attitudes towards surgical intervention. Further, women's desire for work security and freedom from future health risks such as cancer or continued morbidity led most women to view hysterectomy as a 'permanent solution.' Women who had undergone sterilization seemed more comfortable with hysterectomy as a viable treatment option, rather than a last resort. Three women who did not undergo hysterectomy for gynaecological ailments were of similar age and demographic characteristics as the other women interviewed. Each cited fear of surgery as the reason for refusal. One preferred to continue with hormonal treatment, and a second had felt cured once she underwent menopause.

Very few women related side effects of having a hysterectomy. Almost all women who had the surgery several years ago did not report experiencing any difficulty associated with premature menopause, although none had taken hormone replacement therapy. Only one woman, a SEWA community health worker, related difficulties with sexual function and hot flushes after her hysterectomy. Midwives and local health workers felt that the removal of the uterus could be dangerous, but each had supported local women and family members in their decision to undergo hysterectomy.

Box 1. Women's experiences with hysterectomy

Hansaben, an agricultural labourer, age 40 when she underwent a hysterectomy last year:

*I had severe pain in my stomach for two years, but I was scared to see doctors. I have never even had a bottle (IV fluid). I went to Vasna (private doctor)...and then to a trust [*hospital*] for a second opinion. The doctor said there was no way out; the cyst was so big it could not be removed alone. I kept crying, and finally went to one more private doctor who said my blood was low and I could not have surgery right away though I needed it. I took iron pills for 12 months...and then finally had the operation.*

Gajaraben, who labours in a brick kiln, age 36 when she underwent hysterectomy 4 years ago:

I had my periods for 15 days at a time, for 4 months. I went to two doctors...They said to do the test (sonography) and then said that if I don't remove it, I will definitely have cancer. You will have problems in the future, whether you take medicines or not....I did not want cancer in the future. Now I am okay again, I can lift big bricks and work. You can have a fever, cold, cough or weakness and go to work. But for this [menstrual problems] *you can't work unless you take care of it.*

Gauriben, age 40, who could not have children and had severe pain and bleeding:

We didn't know the reason for my problem, and the doctor said the uterus will have to be removed eventually. We also told her that we don't have any kids. She said that, since you don't have that capacity [to have children] *there is no point in keeping the kothri* [uterus].

Madhuben, an agricultural labourer was 25 years old when she had a hysterectomy:

My periods would last for 20–25 days. I used to have a lot of pain. I took medicine prescribed at Civil Hospital [large urban govt hospital] *for one and a half years. I then had a cyst, which they told me when went back to Civil. I took medicines for one more year but nothing improved. I went to 2-3 doctors after that. A year later I finally had a hysterectomy.*

Nakviben, an agricultural labourer who was 22 when she had a hysterectomy:

I had heavy bleeding and a lot of pain. Working was a problem, so I thought to remove it [the uterus]. *I went to three hospitals, who said it was not an emergency but I could remove it later. I tried the medicine but started vomiting. I hate medicines; even if I have a fever, I don't take any* [oral] *medicine... not even home-based remedies. You see, I had a problem and I didn't want medicine. So at last, out of frustration, I removed it. I needed it [the operation] to be healthy.*

Providers' views

All providers interviewed primarily provided obstetric care in their practices. They viewed hysterectomy as a one-time cure for menstrual problems, cysts, fibroids and other gynaecological ailments for rural, low-income women (Box 2). In contrast, they felt urban women, as well as wealthier rural women, had the resources and awareness to try medicines or less extreme procedures such as cystectomy. A consistent theme was that once reproduction was complete or women were sterilized, the uterus was a superfluous organ. With one exception, providers interviewed shared the opinion that side effects of hysterectomy are limited. Private practitioners cited the introduction of a consumer protection act as a stimulus for hysterectomy instead of less invasive treatment, to ensure women would not complain of incomplete treatment if a cyst or fibroid returned. However, one felt the act was a deterrent, due to potential complaints of unnecessary hysterectomy. The two non-profit providers felt the profit motive led private doctors to conduct unnecessary procedures, but felt that women's demand was also a factor.

Local clinics and hospitals offered few preventive services such as diagnosis of reproductive tract infections through microscopy or less invasive treatment like laparoscopic removal of cysts, either due to lack of equipment or skills to perform such procedures. Pap-smear tests were not available, outside of government-sponsored camps held twice a month. Trans-vaginal ultrasounds that could detect fibroids and cysts were not readily available. All providers related the frequent conduct of hysterectomy as a means for young, particularly rural, government doctors to gain surgical skills. Two providers had conducted many hysterectomies during early career rural postings, to help 'perfect the surgical hand'.

Pathways to hysterectomy: mixed methods analysis

Comparing and synthesising findings from both data sets, we identified pathways to hysterectomy that stem from (i) work and economic insecurity (ii) lack of alternate treatment options for gynaecological morbidity, particularly in the primary health care system, (iii) attitudes towards the post-reproductive uterus and, to a lesser extent, (iv) history of sterilization (Figure 2). Aligned with strong evidence from the survey that the incidence of hysterectomy was higher amongst lower-income women, providers reported that hysterectomy was more likely to be prescribed as a first or second-line treatment option for low-income rural women who would not return for follow-up appointments associated with less invasive treatment. Although women without work security underwent a major surgery at considerable financial and physical risk, they believed removing the uterus—deemed a permanent cure for gynaecological ailments—would in fact secure their future productivity.

Qualitative findings pointed to health systems weaknesses, particularly the lack of reproductive and sexual health services, as a reason why hysterectomy was commonly prescribed to treat gynaecological ailments. Lack of knowledge, among both women and providers, about side effects of the procedure further contributed to its normalization. Notably, approximately one-third of women utilized public services for hysterectomy, and almost all women interviewed in-depth reported seeking at least two opinions before undergoing the procedure—suggesting that privatization of health services or provider's profit motivations alone do not explain the pattern of hysterectomies in this setting. Moreover, there was no evidence of an association of being insured by VimoSEWA with hysterectomy.

Women did not report seeking services in a primary care setting for gynaecological ailments, due to lack of availability. Findings also suggested that both women and providers viewed the post-reproductive uterus as a dispensable organ, which may explain why women with more than two children were more likely to undergo hysterectomy. Menstrual taboos, either a product of, or contributor to, attitudes towards the uterus, further strengthened some women's desire to undergo hysterectomy. Lastly, both qualitative and

Box 2. Providers' views

Dr. Nikhil, non-profit charity hospital:

Women are different there [in the city]*—more literate, and they know and understand the indications and problems associated with hysterectomy.*

Dr. Samir, private doctor:

They start bleeding a lot and don't take the proper [hormonal] *treatment course. And they are already sterilized. So somehow, the uterus falls to the wayside, and women ultimately undergo a hysterectomy.*

Dr Gaurang, government doctor:

Basically, if a woman is above 35–36 years, with her kids done, I do a full hysterectomy with oophorectomy. I do this to be safe, otherwise if they get a cyst they come back and say what kind of operation was that? So to be safe, I remove everything. [regarding side effects]: *premature ovarian failure anyway happens by 37, 38 years.*

quantitative data suggested an association between history of sterilization and hysterectomy. From a decision-making perspective, women who had undergone previous sterilization were less likely to try alternative treatment options such as hormonal medicine for gynaecological ailments. They expressed greater comfort with gynaecological surgery as a permanent solution, despite not having sought medical intervention for other health issues including childbirth.

Discussion

Our incidence estimate of 20.7 per 1000 woman-years (95% CI: 14.0, 30.8), the only estimate of incidence in India to our knowledge, is at least four times higher than the highest global rates, such as the United States (5.1 per 1000), Germany (3.6 per 1000) and Australia (3.1 per 1000) [rates in woman-years] (Whiteman et al. 2008; Hill et al. 2010; Stang et al. 2011). This comparison of overall incidence must be interpreted cautiously, however, due to differences in the demographic characteristics of the cohort population. Over 85% of respondents in the study population were women between the ages of 25–54, composed mostly of low-income SEWA members who worked in the informal economy. Age-standardized rates based on findings from a nationally representative sample of women in India will allow for more appropriate comparison to findings from other settings where age-standardized data are available. German estimates are available standardized to the German population structure in 2005 (Stang et al. 2011), but published incidence data from other settings do not present age-specific or age-standardized rates (Whiteman et al. 2008; Hill et al. 2010).

Predictors and underlying determinants

Variations in hysterectomy rates by socioeconomic status, ethnicity and education in high-income settings such as Italy, New Zealand and the United States (Dharmalingam et al. 2000; Materia et al. 2002; Hautaniemi and Leidy Sievert 2003; Bower et al. 2009; Erekson et al. 2009) support the view that hysterectomy is a product of both social and biological processes (Brotherton and Nguyen 2013). Our data from Gujarat suggests a similar situation in India. Higher rates among lower-income women are of particular concern, as they reflect both immediate health risks and embedded inequality. Women workers in India's vast informal economy typically survive on precarious incomes. As women articulated, gynaecological and menstrual disorders disrupt their work security, similar to findings in other low-income settings (Harlow and Campbell 2000; Patel et al. 2006; Black and Fraser 2012). They, therefore, viewed hysterectomy as both pragmatic treatment and prophylaxis, a permanent solution that secured their future earning capacity.

The high proportion of young women sterilized in India, most commonly among low-income women, has considerable health and demographic implications (Matthews et al. 2009). In addition, sterilization appears to be related to an increased risk of hysterectomy. Biologically, tubal ligation has been associated with higher risk of menstrual disorders and gynaecological ailments in some research conducted in the United States, although evidence is mixed (Hillis et al. 1998; Olenick 1998; Ozerkan et al. 2010; Moradan and Gorbani 2012; Nankali et al. 2012). Widespread, normalized surgical sterilization in India may in fact be a precedent for the normalization of 'permanent' solutions to reproductive ailments, for both women and providers. Our findings underscore the need to understand linkages between sterilization and hysterectomy further.

Further, belief that the uterus and ovaries are productive only when reproductive reflects underlying gender biases, as well as a widespread cultural prioritization of women's identity as mothers (Inhorn 2006). Almost no one interviewed believed the uterus or ovaries performed an essential body function after childbearing was complete. Moreover, women viewed it as a potential site of cancer—a liability—for which hysterectomy represented a solution. These findings concur with emerging research in South Asia on the rationale for hysterectomy to prevent future health problems (Towghi 2012; Sardeshpande 2014), as well as reflect women's pragmatic actions to use bio-medicine as a tool to reduce physical and socioeconomic risk (Lock and Kaufert 1998).

Implications for women's health

In this setting, neither women nor providers were aware of potentially adverse side effects of hysterectomy—in accordance with the perception that removal of the uterus and ovaries at young age was generally beneficial or protective. However, even without removal of the ovaries, hysterectomy has been associated with earlier onset of menopause (Farquhar et al. 2005). Women who undergo hysterectomy at a mean age of 36 are at risk of menopause considerably earlier than the estimated global median age at natural menopause, 51 years (Gold et al. 2001). Evidence on the long-term effects of hysterectomy, although inconsistent, also suggests hysterectomy is associated with higher risk of cardiovascular disease, with higher risk among younger women and women who have undergone oophorectomy (Fletcher et al. 2010; Ingelsson et al. 2011; Rocca et al. 2012; Yeh et al. 2013). Recent research in Taiwan suggests that women who undergo only hysterectomy before age 45 are at a higher risk of stroke (RR: 2.29, 95% CI: 1.52, 3.44) (Yeh et al. 2013). Further, hysterectomy has been associated with urinary incontinence and problems with sexual function (Bayram and Beji 2010; Cabness

Table 3. Baseline characteristics associated with incidence of hysterectomy

Variable	*n* with hysterectomy	Rate/1000 woman yrs	95% CI	Unadjusted rate ratio	95% CI
Overall incidence	62	20.7	(14.0,30.8)		
Insurance status					
Uninsured	30	20.9	(13.7,31.2)	1.00	
Insured	32	20.8	(13.9,32.0)	1.01	(0.62,1.64)
Location					
Rural	45	24.3	(13.9,42.4)	1.00	
Urban	17	15.8	(10.2,24.7)	0.65	(0.33,1.29)
Age group					
<25	4	7.4	(13.0,4.16)	0.33	(0.05,2.14)
25–34	16	23.5	(12.6, 44.1)	1.06	(0.46,2.43)
35–44	28	22.2	(1.32,37.4)	1.00	
45–54	13	26.9	(1.38,52.5)	1.21	(0.62,2.34)
55+	1	0.06	(0.06,5.0)	0.03	(0.003,0.21)
Religion					
Hindu	55	21.5	(15.1,30.5)	1.00	
Muslim	7	16.1	(3.5,73.2)	0.75	(0.20,2.75)
Marital status					
Married	58	21.9	(14.7,33.0)	1.00	
Unmarried	1	1.5	(0.1,15.7)	0.07	(0.01,0.66)
Widowed	3	11.6	(1.8,74.8)	0.53	(0.08,3.66)
Number of surviving children					
0–1	1	0.5	(0.1,0.2)	0.03	(0.002,0.20)
2–3	36	24.7	(16.5,36.8)	1.00	
4+	18	25.4	(13.9,51.5)	0.80	(0.37,1.71)
Sterilization history[a]					
Yes	45	27.9	(17.8,43.7)	1.00	
No	10	11.5	(5.1,25.8)	0.41	(0.15,1.16)
Education					
Never attended school	32	19.6	(13.7,28.1)	1.00	
Attended (primary+)	30	21.7	(12.6,36.9)	1.10	(0.67,1.81)
Primary occupation					
Self-employed/service	22	17.3	(11.1,26.6)	1.00	
Agriculture	36	29.1	(15.6,54.5)	1.69	(0.94,3.04)
Salaried	4	11.3	(2.5,5.1)	0.66	(0.13,3.35)
Mean annual HH income (INR)					
0–60 000	29	27.0	(15.9,45.8)	1.00	
60 001–120 000	26	20.3	(10.8,38.0)	0.75	(0.33,1.70)
120 001+	7	3.2	(1.0,97.0)	0.12	(0.03,0.44)
House type					
Mud house	15	33.4	(20.2,55.0)	1.00	
Partial mud and solid	31	20.4	(12.3,33.7)	0.61	(0.29,1.27)
Solid construction	16	15.1	(5.2,43.6)	0.45	(0.13,1.60)
Individual latrine					
No	30	25.5	(15.6,41.8)	1.00	
Yes	32	17.6	(11.3,27.4)	1.45	(0.87,2.41)
Perception of own health					
Very poor	1	9.3	(0.9,94.6)	1.00	
Average	48	20.8	(11.1,38.9)	2.23	(0.23,22.15)
Very good	13	21.2	(9.6,46.9)	2.27	(0.22,23.46)

[a]Data only collected in survey round 4; 294 cases missing.

2010; Hoga et al. 2012; Hunter et al. 2012; Rodriguez et al. 2012; Brown et al. 2000).

Implications for health policy and programs

Our findings suggest that hysterectomy is performed without appropriate diagnostic evaluation or alternative treatments tried. Similar to findings of medical audits in the United States, the lack of clear clinical guidelines for hysterectomy may leave it prone to misuse (Farquhar et al. 2005). Differential treatment of lower-income women and use of hysterectomy as 'practice' in this setting point to embedded biases in health care for women—and reflect a wider culture, beyond this setting, of unnecessary medical intervention in women's reproductive systems (West and Dranov 1994; Angier 1997; Cloutier-Steele 2003). The normalization of hysterectomy also underscores the complex negotiations between women's agency and medically unindicated procedures, as well as the ethical obligations of providers—both of which require further consideration in the Indian context (Lopez 1993; de Bessa 2006; Unnithan-Kumar 2010).

Table 4. Baseline characteristics associated with hysterectomy; multivariable regression

Risk factor	Unadjusted RR	95% CI	*P* value	Adjusted RR[a]	95% CI	P value
Number of surviving children			0.006			0.01
0–1	0.03	(0.002,0.20)		0.02	(0.002,0.22)	
2–3	1.00			(b)		
4+	0.80	(0.37,1.71)		0.81	(0.40,1.66)	
Income level			0.01			0.01
0–60 000	1.00					
60 001–120 000	0.75	(0.33,1.70)		0.71	(0.33,1.53)	
120 001+	0.12	(0.03,0.44)		0.12	(0.03,0.45)	
Age at start of follow-up			0.01			0.006
<25	0.33	(0.05,2.14)		0.56	(0.09,3.23)	
25–34	1.06	(0.46,2.43)		1.08	(0.48,2.43)	
35–44	1.00			(b)		
45–54	1.21	(0.62,2.34)		1.43	(0.77,2.64)	
55+	0.03	(0.003,0.21)		0.03	(0.003,0.23)	
Marital status						
Married	1.00		0.06			0.32
Unmarried	0.07	(0.01,0.66)		0.18	(0.02,1.90)	
Widowed	0.53	(0.08,3.66)		0.65	(0.09,4.61)	
Sterilization history			0.09			0.24
Yes	1.00					
No	0.41	(0.15,1.16)		0.54	(0.19,1.54)	

[a]Final model adjusted for number of surviving children, income and age.

Table 5. Demographic characteristics of 35 women who underwent hysterectomy

Women interviewed		
Mean age at hysterectomy	35.8	
Years since procedure	*n* with hysterectomy	%
<1 year	7	20
<5 years	12	34
5–10 years	7	20
>10 years	9	26
Occupation		
Agricultural	18	51
Health worker	3	9
Manual (non-farm) labourer	6	17
Housework	8	23
Any education		
Yes	10	29
No	25	71
Insurance status		
Insured	11	31
Uninsured	24	69

SEWA insurance was not associated with higher hysterectomy incidence: women and providers both cited the scheme's benefit package was too low to be a financial incentive. However, more research is required to investigate possible influences of more generous coverage offered by government-funded health insurance schemes on increasing the incidence of hysterectomy. Publicly funded health insurance can arguably skew the health system further away from primary gynaecological care, as it only covers tertiary care procedures or admission that exceeds 24 h rather than outpatient services (Selvaraj and Karan 2012).

These findings highlight the need to address the physical and emotional burden of untreated gynaecological morbidity, as reported in several studies in rural and urban India (Bang et al. 1989; Bhatia and Cleland 1995; Bhatia et al. 1997; Latha et al. 1997; Santhya and Jejeebhoy 2003; Bhatnagar et al. 2013). Providers' practices in the private, government and trust facilities were predominantly obstetric; they reported having neither the equipment, time, nor experience to diagnose or treat gynaecological ailments. Moreover, the health system in Gujarat, as reflected in policy documents and observation during this study, focuses on maternal and child health without integrated reproductive and sexual health services at the primary level (NRHM 2011). Without access to timely treatment in a primary care setting, women may approach gynaecologists only when symptoms worsen, perhaps to a point when only surgical interventions are offered. Faced with a lack of preventive services for cancer, hysterectomy appears to serve as a prophylaxis—similar to findings reported in Mexico (Maclean 2005). Lastly, the potential linkages between sterilization, already widely criticized for poor quality of care and coercive policies, and hysterectomy further emphasizes the need for comprehensive reproductive and sexual health services (Mavalankar and Sharma 1999; Das and Contractor 2014).

Strengths and limitations

A primary strength of this study was its mixed methods design, which identified predictors, suggested pathways for associations, and raised new hypotheses to explain hysterectomy patterns in one setting. The use of a cohort to estimate incidence is an important contribution to examining hysterectomy in India. However, the study was conducted in a population comprised only of low-income women, limiting generalizability within India or to national estimates in other countries. Similarly, health is a state subject in India and services vary accordingly; these findings may be specific to the Gujarat health system.

Several factors may have affected our estimates of hysterectomy incidence. Self-reported hysterectomy is subject to reporting error, although the short recall periods and importance of a major and well-known surgery likely limited recall errors. The trial in which this study was nested noted a drop in overall reported

Table 6. Treatment-seeking spectrum among women who had hysterectomy

Grouping (n=35)	Childbirth	Sterilized	Waited to seek treatment	Sought 2+ opinions	Tried medicine /alternatives	Perceived risk of surgery	Main drivers of procedure
Last resort (11)	Primarily home	Half	Yes	Yes	Yes	Fear of surgery	No other option—work and health security
Pragmatic (17)	All home birth	All	Yes	Yes	No	Minimal risk; concerned with future morbidity	Work and health security
Freedom (7)	Institutional	Most	No	No	No	None	Relief from menstruation

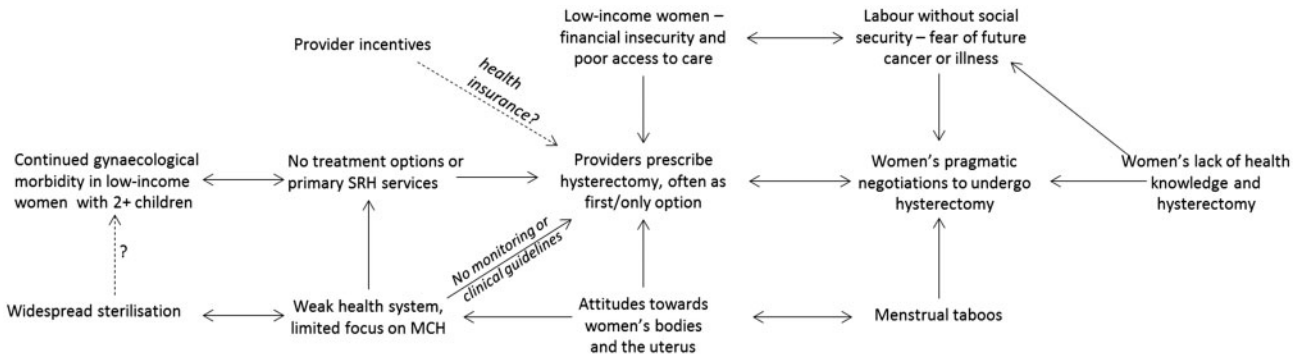

Figure 2. Overview of determinants and pathways associated with hysterectomy.

hospitalization episodes over rounds consistent with survey fatigue, a known risk in cohort studies (Hayes and Moulton 2009), which may have resulted in an underestimate of incidence. Further, the primary respondent in the household was selected for participation based on an association with SEWA, a potential source of bias if SEWA members were more or less likely to undergo hysterectomy. Although retention rates were high until round three, loss to follow-up increased in round four. As a result, we may have under or over-estimated population incidence. Lastly, this study would have been strengthened by inclusion of variables related to women's medical histories in the survey as well as a longer follow-up period.

Conclusion

The burden of untreated morbidity, combined with attitudes towards the uterus, and a health system ill equipped to manage women's gynaecological health needs, has rendered hysterectomy both medically rational, and socially acceptable, for low-income women in this setting. The incidence and determinants of hysterectomy call for urgent intervention to curb its seemingly common use for conditions amenable to less-invasive procedures. Improved access to sexual and reproductive health services within primary health care services is a first step, along with understanding the links between sterilization and hysterectomy. Health education on gynaecological ailments and the potential side effects of hysterectomy and oophorectomy, as well as provider training and health financing for alternative procedures also emerge as important needs. Research at the population level on gynaecological morbidity and hysterectomy is required across India to monitor trends, identify local determinants and track long-term health effects. Encouragingly, the National Family Health Survey will initiate collection of population-based data on hysterectomy in its 2014–15 round, from which age-standardized prevalence, facility choice and the association with health insurance can be examined across settings and over time (Kay 2013). There is no globally recommended appropriate rate of hysterectomy against which to compare Indian trends. However, experience in other settings suggests that national surveillance and medical audits can evaluate appropriateness of the procedure and monitor misuse, as well as support development of clinical guidelines (Dyck et al. 1977; Hansen et al. 2008). Most critically, a rights-based approach to women's health is essential to promote high quality prevention and treatment choices for women through the life cycle, rather than 'permanent' but potentially inappropriate solutions.

Acknowledgements

We are grateful to Dominique Behague for guiding the qualitative research component of this study and to Audrey Prost and Angela Obasi for providing helpful feedback on an earlier version of this paper. Colleagues at SEWA Health, particularly Mirai Chatterjee and Seema Yadav, were instrumental in facilitating this research and providing critical insights into its findings.

Funding

The International Labor Organization Microinsurance Innovation Facility funded the larger trial and qualitative research (Grant R2-149).

Conflict of interest statement. None declared.

References

Angier N. 1997. In a Culture of Hysterectomies, Many Question Their Necessity. *New York Times* February 17, 1997.

Bang RA, Baitule M, Sarmukaddam S, *et al*. 1989. High prevalence of gynaecological diseases in rural Indian women. *The Lancet* **333**: 85–8.

Barghouti FF, Yasein NA, Jaber RM, Hatamleh LN, Takruri AH. 2013. Prevalence and risk factors of urinary incontinence among Jordanian women: impact on their life. *Health Care Women International* **34**: 1015–23.

Bayram GO, Beji NK. 2010. Psychosexual adaptation and quality of life after hysterectomy. *Sexuality and Disability* **28**: 3–13.

BBC. 2013. *The Indian women pushed into hysterectomies* [Online]. Available: http://www.bbc.com/news/magazine-21297606, accessed 5 October 2014.

Bernstein SJ, Mcglynn EA, Siu AL, *et al*. 1993. The appropriateness of hysterectomy: a comparison of care in seven health plans. *JAMA: The Journal of the American Medical Association* **269**: 2398–402.

Bhasin SK, Roy R, Agrawal S, Sharma R. 2011. An epidemiological study of major surgical procedures in an urban population of East Delhi. *Indian Journal of Surgery* **73**: 131–5.

Bhatia JC, Cleland J. 1995. Self-reported symptoms of gynecological morbidity and their treatment in south-India. *Studies in Family Planning* **26**: 203–16.

Bhatia JC, Cleland J, Bhagavan L, Rao NSN. 1997. Levels and determinants of gynecological morbidity in a district of South India. *Studies in Family Planning* **28**: 95–103.

Bhatnagar N, Khandekar J, Singh A, Saxena S. 2013. The silent epidemic of reproductive morbidity among ever married women (15–49 years) in an urban area of Delhi. *Journal of Community Health* **38**: 250–6.

Bickell NA, Earp J, Evans AT, Bernstein SJ. 1995. A matter of opinion about hysterectomies: experts' and practicing community gynecologists' ratings of appropriateness. *American Journal of Public Health* **85**: 1125–8.

Bickell NA, Earp JA, Garrett JM, Evans AT. 1994. Gynecologists' sex, clinical beliefs, and hysterectomy rates. *American Journal of Public Health* **84**: 1649–52.

Black KI, Fraser IS. 2012, The burden of health associated with benign gynecological disorders in low-resource settings. *International Journal of Gynecology and Obstetrics* **119**: S72–5.

Bower JK, Schreiner PJ, Sternfeld B, Lewis CE. 2009. Black-white differences in hysterectomy prevalence: the CARDIA study. *American Journal of Public Health* **99**: 300–7.

Broder MS, Kanouse DE, Mittman BS, Bernstein SJ. 2000. The appropriateness of recommendations for hysterectomy. *Obstetrics & Gynecology* **95**: 199–205.

Brotherton PS, Nguyen VK. 2013. Revisiting local biology in the era of global health. *Medical Anthropology* **32**: 287–90.

Brown JS, Sawaya G, Thom DH, Grady D. 2000, Hysterectomy and urinary incontinence: a systematic review. *The Lancet* **356**: 535–9.

Byles JE, Mishra G, Schofield M. 2000. Factors associated with hysterectomy among women in Australia. *Health & Place* **6**: 301–8.

Cabness J. 2010. The psychosocial dimensions of hysterectomy: private places and the inner spaces of women at midlife. *Social Work Health Care* **49**: 211–26.

Carlson KJ, Nichols DH, Schiff I. 1993. Indications for hysterectomy. *New England Journal of Medicine* **328**: 856–60.

Cloutier-Steele L. 2003. *Misinformed Consent: Women's Stories About Unnecessary Hysterectomy*. Chester, NJ: Next Decade, Inc.

Creswell JW. and Plano Clark V. 2007. Designing and conducting mixed methods research. Thousand Oaks, CA: Sage.

Das A, Contractor S. 2014. India's latest sterilisation camp massacre. *British Medical Journal* **349**: g7282.

de Bessa GH. 2006. Medicalization, reproductive agency, and the desire for surgical sterilization among low-income women in urban Brazil. *Medical Anthropology* **25**: 221–63.

Desai S, Sinha T, Mahal A. 2011. Prevalence of hysterectomy among rural and urban women with and without health insurance in Gujarat, India. *Reproductive Health Matters* **19**: 42–51.

Desai S., Sinha T, Mahal A and Cousens S. 2014. Understanding CBHI hospitalisation patterns: a comparison of insured and uninsured women in Gujarat, India. *BMC Health Services Research* **14**: 320.

Desai S. 2015. The effect of health education on women's treatment-seeking behaviour: Findings from a cluster randomised trial and an in-depth investigation of hysterectomy in Gujarat, India. *Doctoral dissertation, Faculty of Epidemiology and Population Health*, London School of Hygiene & Tropical Medicine.

Desai S., 2016. Pragmatic prevention, permanent solution: Women's experiences with hysterectomy in rural India. *Social Science & Medicine* **151**: 11–18.

Dharmalingam A, Pool I, Dickson J. 2000. Biosocial determinants of hysterectomy in New Zealand. *American Journal of Public Health* **90**: 1455–8.

Dyck FJ, Murphy FA, Murphy JK, *et al*. 1977. Effect of surveillance on the number of hysterectomies in the province of Saskatchewan. *New England Journal of Medicine* **296**: 1326–8.

Einarsson JI, Matteson KA, Schulkin J, Chavan NR, Sangi-Haghpeykar H. 2010. Minimally invasive hysterectomies—a survey on attitudes and barriers among practicing gynecologists. *Journal of Minimally Invasive Gynecology* **17**: 167–75.

Erekson EA, Weitzen S, Sung VW, Raker CA, Myers DL. 2009. Socioeconomic indicators and hysterectomy status in the United States, 2004. *Journal of Reproductive Medicine* **54**: 553–8.

Farquhar CM, Sadler L, Harvey SA, Stewart AW. 2005. The association of hysterectomy and menopause: a prospective cohort study. *BJOG: An International Journal of Obstetrics & Gynaecology* **112**: 956–62.

Fletcher HM, Bennett F, Simms-Stewart D, *et al*. 2010. Cardiovascular disease risk factors in menopausal Jamaican black women after hysterectomy and bilateral oophorectomy: an observational study. *The West Indian Medical Journal* **59**: 625–32.

Gimbel H, Ottesen B, Tabor A. 2002. Danish gynecologists' opinion about hysterectomy on benign indication: results of a survey. *Acta Obstetricia et Gynecologica Scandinavica* **81**: 1123–31.

Gold EB, Bromberger J, Crawford S, *et al*. 2001. Factors associated with age at natural menopause in a multiethnic sample of midlife women. *American Journal of Epidemiology* **153**: 865–74.

Hansen CT, Moller C, Daugbjerg S, *et al*. 2008. Establishment of a national Danish hysterectomy database: preliminary report on the first 13,425 hysterectomies. *Acta Obstetricia et Gynecologica Scandinavica* **87**: 546–57.

Harlow SD, Campbell OMR. 2000. Menstrual dysfunction: a missed opportunity for improving reproductive health in developing countries. *Reproductive Health Matters* **8**: 142–7.

Hautaniemi SI, Leidy Sievert L. 2003. Risk factors for hysterectomy among Mexican-American women in the US southwest. *The American Journal of Human Biology* **15**: 38–47.

Hayes R and Moulton L. 2009. *Cluster Randomised Trials*. Boca Raton: Chapman & Hall/CRC.

Hill EL, Graham ML, Shelley JM. 2010. Hysterectomy trends in Australia–between 2000/01 and 2004/05. *The Australian & New Zealand Journal of Obstetrics & Gynaecology* **50**: 153–8.

Hillis SD, Marchbanks PA, Tylor LR, Peterson HB. 1998. Higher hysterectomy risk for sterilized than nonsterilized women: findings from the U.S. Collaborative Review of Sterilization. *Obstetrics and Gynecology* **91**: 241–6.

Hoga LAK, Higashi AB, Sato PM, *et al*. 2012. Psychosexual perspectives of the husbands of women treated with an elective hysterectomy. *Health Care for Women International* **33**: 799–813.

Hsieh CH, Lee MS, Lee MC, *et al*. 2008. Risk factors for urinary incontinence in Taiwanese women aged 20–59 years. *Taiwanese Journal of Obstetrics & Gynecology* **47**: 197–202.

Hunter MS, Gentry-Maharaj A, Ryan A, *et al*. 2012. Prevalence, frequency and problem rating of hot flushes persist in older postmenopausal women: impact of age, body mass index, hysterectomy, hormone therapy use, lifestyle and mood in a cross-sectional cohort study of 10,418 British women aged 54–65. *BJOG: An International Journal of Obstetrics and Gynaecology* **119**: 40–50.

IIPS. 2010. *District Level Household and Facility Survey (DLHS-3) 2007–08*. Gujarat, Mumbai: Indian Institute of Population Studies.

IIPS/ORCMACRO. 2006. National Family Health Survey-3. Indian Institute of Population Sciences.

Ingelsson E, Lundholm C, Johansson AL, Altman D. 2011. Hysterectomy and risk of cardiovascular disease: a population-based cohort study. *The European Heart Journal* **32**: 745–50.

Inhorn MC. 2006. Defining women's health: a dozen messages from more than 150 ethnographies. *Medical Anthropology Quarterly* **20**: 345–78.

Jain Y, Kataria R. 2012. Diagnosis of a prolapse. The Hindu 16 July 2012.

Kameswari S, Vinjamuri P. 2013. Case Study on Unindicated Hysterectomies in Andhra Pradesh. National Workshop on Rising Hysterectomies in India, August 2013: Life-Health Reinforcement Group.

Kaur S, Walia I, Singh A. 2004. How menopause affects the lives of women in suburban Chandigarh, India. *Climacteric* **7**: 175–80.

Kay M. 2013. India will collect data to tackle overuse of hysterectomy. *British Medical Journal* 347: f5368.

Lam JS, Tay WT, Aung T, Saw SM, Wong TY. 2014. Female reproductive factors and major eye diseases in Asian women – the Singapore Malay Eye Study. *Ophthalmic Epidemiology* **21**: 92–8.

Latha K, Kanani S, Maitra N, Bhatt R, Senapati S. 1997. Prevalence of clinically detectable gynaecological morbidity in India: results of four community based studies. *Journal of Family Welfare* **43**: 8–16.

Lingard L, Albert M, Levinson W. 2008. Grounded theory, mixed methods, and action research. *British Medical Journal* **337**: a567–a567.

Lock M, Kaufert PA. 1998. *Pragmatic Women and Body Politics*. Cambridge: Cambridge University Press.

Lopez I. 1993. Agency and constraint: sterilization and reproductive freedom among Puerto Rican women in New York City. *Urban Anthropology and Studies of Cultural Systems and World Economic Development* **22**: 299–323.

Maclean R. 2005. In Mexico, hysterectomy is often used as treatment for cervical abnormalities. *International Family Planning Perspectives* **31**: 96–7.

Majumdar S. 2013. *Forced hysterectomies, unscrupulous doctors* [Online]. Available: http://southasia.oneworld.net/news/forced-hysterectomies-unscrupulous-doctors#.VDLCF1fgJRE, accessed 5 October 2014.

Materia E, Rossi L, Spadea T, *et al*. 2002. Hysterectomy and socioeconomic position in Rome, Italy. *J Epidemiology and Community Health* **56**: 461–5.

Matthews Z, Padmadas SS, Hutter I, Mceachran J, Brown JJ. 2009. Does early childbearing and a sterilization-focused family planning programme in India fuel population growth? *Demographic Research* **20**: 693–720.

Mavalankar DV, Sharma B. 1999. The Quality of Care in Sterilisation Camps: Evidence from Gujarat In: Improving quality of care in India's Family Welfare Programme, edited by Michael A. Koenig and M.E. Khan. New Delhi, India: Population Council.

Moradan S, Gorbani R. 2012. Is previous tubal ligation a risk factor for hysterectomy because of abnormal uterine bleeding? *Oman Medical Journal* **27**: 326–8.

MOSPI. 2015. *State Domestic Product and Other Aggregates* [Online]. Available: http://mospi.nic.in/Mospi_New/site/inner.aspx?status=3&menu_id=82, accessed 27 August 2015.

Nankali A, Najafi F, Keshavarzi F, Bastani A, Chin SD. 2012. Relationship between tubal ligation and risk of hysterectomy. *Iranian Journal of Obstetrics, Gynecology and Infertility* **15**: 16–21.

NRHM. 2011. *Outcome Analysis of Program Implementation Plan*. Gujarat.

O'Cathain A, Murphy E, Nicholl J. 2010. Three techniques for integrating data in mixed methods studies. *British Medical Journal* 17: 341:c4587

Olenick I. 1998. The risk of hysterectomy quadruples after women undergo sterilization. *Family Planning Perspectives* **30**: 297.

Ong S, Codd MB, Coughlan M, O'Herlihy C. 2000. Prevalence of hysterectomy in Ireland. *International Journal of Gynecology & Obstetrics* **69**: 243–7.

OXFAM. 2013. *Unregulated and Unaccountable:* [Online]. Oxfam. Available: http://policy-practice.oxfam.org.uk/publications/unregulated-and-unaccountable-how-the-private-health-care-sector-in-india-is-pu-268392, accessed 24 November 2014.

Ozel B, Borchelt AM, Cimino FM, Cremer M. 2007. Prevalence and risk factors for pelvic floor symptoms in women in rural El Salvador. *International Urogynecology Journal and Pelvic Floor Dysfunction* **18**: 1065–9.

Ozerkan K, Aydin G, Koc I, Uncu Y, Uncu G. 2010. Menstrual pattern following tubal sterilization. *Medical Science Monitor* **16**: CR197–201.

Palmer JR, Rao RS, Adams-Campbell LL, Rosenberg L. 1999. Correlates of hysterectomy among African-American women. *The American Journal of Epidemiology* **150**: 1309–15.

Patel V, Tanksale V, Sahasrabhojanee M, Gupte S, Nevrekar P. 2006. The burden and determinants of dysmenorrhoea: a population-based survey of 2262 women in Goa, India. *BJOG: An International Journal of Obstetrics and Gynaecology* **113**: 453–63.

Ranson MK, John KR. 2001. Quality of hysterectomy care in rural Gujarat: the role of community-based health insurance. *Health Policy Plan* **16**: 395–403.

Rocca WA, Grossardt BR, Shuster LT, Stewart EA. 2012. Hysterectomy, oophorectomy, estrogen, and the risk of dementia. *Neurodegenerative Diseases* **10**: 175–8.

Rodriguez MC, Chedraui P, Schwager G, Hidalgo L, Perez-Lopez FR. 2012. Assessment of sexuality after hysterectomy using the Female Sexual Function Index. *Journal of Obstetrics and Gynecology* **32**: 180–4.

Santhya K, Jejeebhoy SJ. 2003. Sexual and reproductive health needs of married adolescent girls. *Economic and Political Weekly* **37**: 4370–7.

Sardeshpande N. 2014. Why do young women accept hysterectomy? Findings from a study in Maharashtra, India. *International Journal of Innovation and Applied Studies* **8**: 579–85.

Sarna A, Friedland BA, Srikrishnan AK, *et al*. 2013. Sexually transmitted infections and reproductive health morbidity in a cohort of female sex workers screened for a microbicide feasibility study in Nellore, India. *Global Journal of Health Science* **5**: 139–49.

Selvaraj S, Karan AK. 2012. Why publicly-financed health insurance schemes are ineffective in providing financial risk protection. *Economic & Political Weekly* **47**: 61–8.

Shakhatreh FM. 2005. Epidemiology of urinary incontinence in Jordanian women. *Saudi Medical Journal* **26**: 830–5.

Singh A, Arora AK. 2008. Why hysterectomy rate are lower in India. *Indian Journal of Community Medicine* **33**: 196–7.

Singh S. 2012. 16,000 'illegal' hysterectomies done in Bihar for insurance benefit. *Indian Express* 27 August 2012.

Spilsbury K, Semmens JB, Hammond I, Bolck A. 2006. Persistent high rates of hysterectomy in Western Australia: a population-based study of 83 000 procedures over 23 years. *BJOG: An International Journal of Obstetrics and Gynaecology* **113**: 804–9.

Stang A, Merrill RM, Kuss O. 2011. Hysterectomy in Germany: a DRG-based nationwide analysis, 2005–2006. *Dtsch Arztebl International* **108**: 508–14.

Stankiewicz A, Pogany L, Popadiuk C. 2014. Prevalence of self-reported hysterectomy among Canadian women, 2000/2001–2008. *Chronic Diseases and Injuries in Canada* **34**: 30–5.

Towghi F. 2012. Cutting inoperable bodies: particularizing rural sociality to normalize hysterectomies in Balochistan, Pakistan. *Medical Anthropology* **31**: 229–48.

Unnithan-Kumar M. 2010. Female selective abortion – beyond 'culture': family making and gender inequality in a globalising India. *Culture, Health & Sexuality* **12**: 153–66.

West S, Dranov P. 1994. *The hysterectomy hoax*. Doubleday. New York **4**: 21.

Whiteman MK, Hillis SD, Jamieson DJ, *et al*. 2008. Inpatient hysterectomy surveillance in the United States, 2000–2004. *American Journal of Obstetrics and Gynecology* **198**: 34 e1–7.

Yeh JS, Cheng HM, Hsu PF, *et al*. 2013. Hysterectomy in young women associates with higher risk of stroke: a nationwide cohort study. *International Journal of Cardiology* **168**: 2616–21.