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Contraceptive use and fertility intentions of women in the reproductive age group (15-49) among the various indigenous groups in Kerala , India

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Title page

Contraceptive use and fertility intentions of women in the reproductive age group (15-49) among the various indigenous groups in Kerala , India

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- **Abstract:**

Objectives : To assess contraceptive use , determinants; knowledge regarding contraceptives in general, oral contraceptives and fertility intentions among indigenous women in the reproductive age group.

Design : Community based cross sectional study

Setting : Community Development blocks in a predominantly tribal district of Wayanad in Kerala, India.

Participants: Women in the reproductive age group (15-49 years) from the indigenous groups in the district.

Outcome measures:
Primary: Prevalence of Contraceptive use and its determinants
Secondary: Knowledge regarding contraceptives in general, oral contraceptives and fertility intentions.

Results: The mean age of the study participants was 30.8+9.8 yrs. The women belonged to Paniya, Kurichiyar and Adiya tribal groups at 59.2,13.6,10.9 percent respectively. Current use of contraceptives was reported by about a fourth, 658(26.4%)(95% CI 27.9,24.9) of women. In the logistic regression belonging to Paniya tribe(aOR 2.67, 95% CI 1.49,4.77;p<.001), age at menarche >13 yrs (aOR 1.69, 95% CI 1.14,2.52; p<0.009)had significantly higher use of contraceptives whereas social vulnerability as indicated by staying in a kutcha house had a lesser likelihood of use of contraceptive (aOR 0.55, 95% CI .31,.95;p<.035). Oral contraceptive use was low (4.8%) among this population and no abuse was observed.

Only, less than a half (47%) of the respondents had good knowledge. Multivariable logistic regression indicates that better knowledge was 2.2 times more likely with higher education (95% CI 1.2,3.9), lesser with those who desired more than two children (aOR .59;95% CI .38,.94;p<.025).

Two children per family was the preferred choice of 1060(42.5%). There did not appear to be a gender bias in favour of the male child.

Conclusion:

Targeted responses to contraceptive awareness and use with indigenous data are necessary in view of the low awareness and use. Ethnographic studies are necessary to determine the differences in contraceptive use including traditional methods among the various indigenous groups.

Article Summary
Strengths and Limitations of this study :

Strengths :

- Community based study
- Only few studies have been conducted on contraceptive use among women of the indigenous tribal population

Limitations:

- Spatial or temporal association could not be studied which may be a determinant.

- **Funding statement:**

This work was supported by the Ministry of Tribal affairs, Govt of India as part of the Centre of Excellence initiative granted to our University by the Ministry 11030/03/2018

- **Competing interest statement :**
  There are no competing interests

Keywords: Contraceptive use, knowledge, Indigenous people, women in the reproductive age group, Kerala

Patient consent form: Patients are in a tribal area in Wayanad in difficult terrain about 12 hrs from here. The consent that was obtained at the time of the study can be submitted.

Supplementary and Raw Data: Will be provided after obtaining permission from the Ministry of Tribal Affairs

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Introduction

India has one of the largest total populations of Indigenous peoples second only to China at 104 million. [1,2] The data across the world provide evidence of poorer health and social outcomes for Indigenous peoples than for non-Indigenous populations. However, this is not uniformly the case, and the size of the rate difference varies. [3]

Tribal people in independent countries are those "whose social, cultural, and economic conditions distinguish them from other sections of the national community and whose status is regulated wholly or partly by their own customs or traditions or by special laws or regulations; and peoples in independent countries who are regarded as indigenous because of their descent from the populations who inhabited the country, or a geographical region to which the country belongs, at the time of conquest or colonisation or the establishment of present state boundaries and who, irrespective of their legal status, retain some or all of their own social, economic, cultural, and political institutions".[4] Among the social groups in India, the tribes are the most socioeconomically deprived groups, with low literacy and poor economic and living conditions. [5] In India, scheduled tribes (ST) refer to various aboriginal ethnic minorities, who are concentrated in hilly lands in the Himalayas, Eastern Ghats, Western Ghats, Deccan Plateau, and other hilly regions.[6] The ST's also called adivasis not only have distinct cultural and linguistic characteristics but are also spatially isolated which is also cited as a reason for deprivation. [7] In addition fertility indices are found to be higher in general.

In most Latin American and Caribbean countries, coverage with modern contraception (median coverage ratio 0·82, IQR 0·66–0·92), was lower among indigenous women than in the reference group. These differences persisted after adjustment for wealth, education, and residence. [8] Due to all the above reasons and more, the tribes have a very low contraceptive usage and high unmet need for family planning than the other groups .6 A micro-level study conducted on tribes in south India found low contraceptive usage and high unmet need for family planning among Adiya and Kattunayakan women in Kerala at 68% and 62% . [9]

In the light of sparse knowledge regarding contraceptive use among the tribal groups, this study was initiated with the objective of assessing contraceptive use and its determinants, knowledge regarding contraceptives in general and oral contraceptives and fertility intentions.

Methods

The study was conducted among women belonging to indigenous groups in the reproductive age group in two of the three randomly selected Community development blocks of a predominantly tribal district, Wayanad in Kerala, India. Two of the three Community Development blocks were randomly selected namely Kalpetta and Mananthavady. According to a study conducted in Wayanad the contraceptive use among tribals of Wayanad was 40.7%.[9] With 95% confidence interval and 10% relative precision using the formula 4pq/d2 the sample size was calculated to be 583. With a design effect of 2 a final sample size of 1166 was obtained and rounded to 1200. Considering the cluster size to be a minimum of 30 a total of 40 clusters were selected by Population proportionate to size from the two blocks. According to the 2011 census the total population of tribal origin in the 2 CD blocks was 46,598. The sampling interval was 1165 and the first number randomly selected was 264 which was ward 1 of Thirunelly grama panchayat of Mananthavady CD block. Then 40 clusters were selected by adding the sampling interval.

Ethical approval was obtained from the Institutional Ethical Committee IEC-AIMS-2018-COMM-147 dated Sept 22, 2019. Informed video consent was obtained from the study participants.

The women in the 15-49year age group were interviewed with a semi structured questionnaire by trained volunteers from the district who underwent a two-day training on Contraception, communication skills, rapport building and questionnaire administration from the investigators. A total of 2495 women were interviewed with 1161 from Kalpetta and 1334 from Mananthavady. The qualitative variables are expressed as proportion, percentage and the quantitative in mean and SD. The knowledge scores were then categorized with the mean value as the cut off into good and poor. The missing values were in the range of 3% -8%. The occupation variable had a larger missing value at 18% and was interpreted with caution.
The outcomes studied were contraceptive use, knowledge, attitude regarding contraception and its determinants. Attitude to reproductive rights and contraception is not discussed here. Knowledge questions on contraceptives in general and on oral contraceptives, emergency contraception in particular, were assessed with a total score of 2.5 for general knowledge questions and 3.75 for oral contraceptives and 1.5 for emergency contraceptives. Those having above mean scores, 0.8 for general knowledge on contraceptives, 2.2 for oral contraceptives and 0.2 for emergency contraception were considered to have good knowledge. The exposure variables for good knowledge were considered to be age, marital status, education, occupation, type of house, tribe, no of children, tobacco use, alcohol use, age at menarche, current contraceptive use, knowledge regarding emergency contraception, oral contraception. what they considered as the ideal family size. The exposure variables of contraceptive use were age, marital status, education, occupation, type of house, tribe, no of children, tobacco use, alcohol use, age at menarche, knowledge in general regarding contraceptives, knowledge regarding emergency contraception, oral contraception and number of children. Logistic regression was done among the variables with a $p < .2$ and logistic regression was done to take care of the confounding and to determine independent predictors.

In order to address the bias due to poor rapport, self-reports of contraceptive use, a repeat study was conducted in a subset (300) to assess the contraceptive prevalence and to determine the presence of menstrual huts which was reported during the initial study(not discussed here).This was also followed up with a qualitative study to understand the barriers and facilitators determinants in greater depth(not discussed here).

Patient and Public Involvement : The research question for the study was developed after identifying several gaps during literature search regarding contraceptive use among tribals. The outcome measures namely the contraceptive use and its determinants, knowledge regarding contraceptives in general and fertility intentions,

were chosen considering the relevance of these indicators to the research question.Public involvement was brought about by training and involving the members of these indigenous groups in data collection. Dissemination activities were also carried out.

Results

The mean age of the study participants was 30.8±9.8 yrs. The women belonged to Paniya, Kurichiyar and Adiya tribal groups at 59.2,13.6,10.9 percent respectively. Other tribes included Kattunayakan, Uralikuruma, Kurumba chanandan, Moopan. About 395(17.2%) were illiterate and a third each (32.6% and 33.2%) had 7 years and 12 years of schooling. About a fifth (19.7%) lived in kutcha houses(Table 1). The mean per capita income was Rs 820.37±1979. However, a large number did not reveal their income.

The mean age at menarche was 13.21±1.5 yrs. Regarding marital status, 1695(70%) of the women were married, 4.6% were separated or living separately and there were 0.3% unwed mothers. The mean family size was 4.52±1.62. The use of tobacco was quite common with more than half 1436(57.6%) of the women having used it in the last month. About 92(3.7%) had used alcohol in the previous month.

Majority of the women 2075 (83.2%) had regular menstrual periods and 97.2% had a menstrual cycle duration of within 45 days. Abdominal Pain associated with periods was experienced by 37.5%. The majority (86%) did not experience any bleeding or spotting between periods. The mean duration of menstrual periods was 4.07± 1.33. Only, 4.7% reported that they had bleeding in between periods and 0.4% said that they had bleeding after intercourse. A small proportion, 3.3% of the women in the reproductive age group were currently pregnant. The mean number of children borne to the respondents was 2.34 ± 1.18. About a tenth,11.6% gave a history of abortion and the mean number of abortions was 1.41±1.08. (Table 1)

Surprisingly, more than a half 1468(58.8%) said that they had not heard of the term contraceptives /family welfare measures. On further probing, less than a half 590/1256(47%) had good knowledge of contraceptives in general. Only 433(17.4%) reported having heard of oral contraceptives. Only 68 answered further knowledge questions on OCP of which about a third (33.8%) of the women had good knowledge.

The couples with current use of contraceptives were 658(26.4%) more than a fourth. This was validated by a second study among a subset of 298 reproductive age women where the prevalence of contraceptive use was found to be almost the same at 29%.

Among those who had used contraceptives, a majority 386/658(58.6%) had used permanent methods and a similar percentage of women 121/658(18.3%), had used hormonal contraceptives, condoms and only 30/658(4.5 %) used Cu T. The past use of temporary contraception was reported by 12%. Among the temporary contraceptives, the past use and current use demonstrated that CuT as a method of contraception was relegated to second and third place giving way to hormonal contraceptives, mostly oral contraceptives and condoms. Most of them relied on the Govt health system for their contraceptive needs and obtained it from primary health centres, Accredited Social Health Activists (ASHA), District hospitals and a few from medical shops. The most recent use of contraceptive reported was for family planning more than half of the time 58.6%(237/404), 7.1%(29/404) for religious reasons, 4.9%(20/404) was at the partner's insistence. Despite the current use of contraceptives being only 26%, less than 1% (23/2495) women reported accidental pregnancy. Only 206 (8.3%) had heard of emergency contraception. The knowledge regarding emergency contraception was good among only a fifth, 21.5% (247/1146). About 39 women (1.6%) reported that they had used emergency contraception.

Among those who reported not having used a contraceptive, worrying about the side effects (13.5%) and partners not wanting to use a method (11.8%) were the main reasons. About 4.8% also mentioned that they did not know how to use the contraceptive method and 7.2% did not need to use a contraceptive method as they were below 18. About a fourth, 26.4% mentioned a variety of reasons for not using such as husband's illness, have decided not to use, have not felt its need, wanted pregnancy, divorced, self -control, need one more child, recently married and not pregnant, natural methods, planning to conceive and planning to do tubectomy, staying away from husband, not staying together with spouse, widow etc.

Regarding oral contraceptives which was a particular focus of this study, about 61.5% had never used oral contraceptives. Most of the users of oral contraceptives 27/58 had only used it sometimes. About a half

28/58(48.2%) used OCP for attending religious rituals and (41.3%)24/58 for contraceptive use. The most reported side effects were irregularity in menstrual cycle (24.64%) and vomiting (15.94%).

Determinants of knowledge of contraceptive use

The mean knowledge score was 0.8. It was surprising to note that 1468/2495 said that they had not heard of contraceptives or family planning measures. On further probing this decreased to 1027 i.e 1256 had heard of contraceptives. Only more than a third(36.7%) had good knowledge of contraceptives.

After multivariate logistic regression, the educated were found to have a 2.2 times greater likelihood of good knowledge(95% CI 1.2,3.9) about contraceptives. Compared to other indigenous groups Paniya's had 67% poorer knowledge (aOR .33 95% CI 0.17,0.65). Tobacco use was an independent determinant of poor knowledge (aOR .51 95% CI 0.318,0.817). Though the current use of contraceptives was 1.2 times more likely with good knowledge, this was not significant. Knowledge of emergency contraception was an important determinant of general knowledge of contraceptives (aOR 6.9,95% CI 3.86,12.36;p<.001).

Though a clustering of risk factors for poor knowledge of contraceptives such as tobacco, alcohol use and illiterate was observed, only the educated was found to be an independent variable for good knowledge (OR 2.2;95% CI 1.2,3.9). Those who desired more than two children irrespective of whether they were boys or girls had significantly lower knowledge (aOR .59;95% CI .38,.94;p<.025)(Table 2). Others such as age >31 years, employed ,married women, more than three children having significant association with knowledge disappeared with regression analysis.

The knowledge of oral contraceptives was also assessed as the overuse of contraceptives is present in some other tribal communities. However, there was no overuse of oral contraceptives as determined by this study and as also reported by the tribal officers of the area. More than half of the women198(55.6%) in the reproductive age group with good knowledge said that another child is not required if existing two children belong to the same sex compared to 360(44.8%) in those who said yes(p<.001)indicating no bias for male children.

Determinants of contraceptive use

A binomial logistic regression of the determinants of current use of contraceptive showed that age at menarche >13 yrs (aOR 1.69, 95% CI 1.14,2.52; p<0.009) and belonging to paniya tribe had significantly higher use of contraceptive (aOR 2.67, 95% CI 1.49,4.77;p<.001). Though Kattunaickens, a PVTG had lower use of contraceptive this was not significant. Those who stayed in a kutcha house were also less likely to have used a contraceptive(aOR 0.55, 95% CI .31,.95;p<.035). Other variables such as being employed, having more than three children, marital status, poorer knowledge scores though significantly associated in the univariate analysis (Table 3) disappeared in the regression analysis done by the enter method. Among the different tribes Kattunaicken group had the lowest use of contraceptive at 23.8%, followed by other groups at 26.5% and 39.9% among Paniya's. It is not surprising that the kattunaicken group had the lowest contraceptive use as they are a Particularly vulnerable tribal group.

A larger proportion of women(42.5%) preferred two children per family closely followed by (38.2%) of the women desiring 3 children. The spacing between children suggested was three years by 31.2% and 4 years by 17.8%. There did not appear to be a gender bias in favour of the male child as only 98(3.9%) of women reported that another child was necessary if both the children were girls. Similarly, only about 102(4.1%) reported that another child was necessary if the children were both boys.

Discussion

The current use of contraceptives was reported by 26.4% of indigenous women in the reproductive age group. Knowledge of contraceptives underpins use. Good knowledge scores were found to be higher among the educated and aligned with good knowledge of emergency contraceptives. It was lower among those who desired more than two children and among one of the backward tribes, the Paniya's.

Among the 26.4% contraceptive users, 58.6% used permanent methods, 18.0% each used hormonal contraceptives and condoms, 4.5 % used CuT and 0.8% used traditional methods. The use of contraceptives in the state was much higher at 53 percent[10] compared to 26.4% in this study. The contraceptive use varies in other states among the tribals with higher use in Assam (36%)[11] and Bengal 40% [12] and varied in Maharashtra from 18.7% [13] to a

spacing contraceptive use of 27.7% (10.8% pill, 13.3% condom, 2.0% IUD, 1.6% withdrawal or rhythm).[14] Thus different tribal groups have different contraceptive use rates. In neighbouring Bangladesh the contraceptive use among tribals was very high at 73% which was also much higher than among the general population of that country.[15] The primary reason for low contraceptive use may be the low access to contraceptive knowledge and services as observed in Maharashtra and Tamil Nadu.[14,16] Other reasons could be early child bearing observed among tribal groups in Andhra Pradesh where 10.5% were likely to give birth by the time they were 19 years old [17] which was in turn associated with low contraceptive use[8] and lower education.[16] Other studies in central India substantiated the role of women and husbands' education[18], age of women, and number of surviving boys in the use of any modern method of contraception.[6] Nevertheless, the different ethnographical backgrounds of the various tribal groups across different parts of India result in a non uniform pattern. The independent determinants of contraceptive use in this study belonged to the Paniya group and a lower use was observed among those staying in a kutcha house. Though, India as a whole has maintained a steady decline in fertility [19], studies among tribal communities' report some of the lowest rates of contraceptive use and an increasing fertility rate.[19] Except the scheduled tribes who have a total fertility rate (TFR) of 2.3, the TFR of all population groups in Kerala are below replacement level at 1.6 .[10] This also corresponds to the mean number of children in this study at 2.34±1.18. The total fertility rate in central Indian state of Madhya Pradesh among the indigenous tribes was 2.7.[20] Though, the fertility levels in this study are higher than the general population it is not as high as the other tribal communities indicating the use of perhaps other traditional methods such as withdrawal method, calendar method etc which may not have been revealed fully in this cross-sectional study or the influence of the general population. Traditional method uses such as rhythm, withdrawal is the highest in the state in this district at 5.6%.[10] This district where the study was also carried out has the largest number of people belonging to the indigenous groups.
Knowledge of contraception is almost universal in Kerala. Among all women, 44 percent knew about emergency contraception.[10] However, in the current study only 36.7% had good knowledge of contraceptives. This is similar to other studies also with Prusty et al. reporting considerably lower knowledge among tribal women compared to their non-tribal counterparts in the three central Indian states.[6] Whereas in another study in the north eastern part of India, Assam the tribal women had good knowledge of contraceptive and the contraceptive use was also high.[11]The awareness levels of contraception in general was closely aligned with the awareness of emergency contraceptives and it was a significant predictor(aOR 6.9,95% CI3.86,12.36) including educational levels(aOR:2.2, 95% CI 1.2,3.9). Findings suggest that lower spacing contraceptive use among tribals is driven by social vulnerabilities and higher fertility preferences.[14]

Gender norms related to fertility is an important issue determining contraceptive use in the tribal community.[21] Gender relations among Indian tribes have historically been more balanced and equitable; however there is an increasing trend of gender bias in tribal culture emerging due to the assimilation and modernising process.[22] The tribes in Kerala seem to be more equitable with a male child preference not indicated with the desire for a third child expressed when the initial two children are of the same sex. In the north eastern state of Meghalaya where 86% of the population is tribal, the largest proportion of population follow a matrilineal system. The contraceptive use of 20.2% was the lowest, and the total fertility rate of 4.57 was the highest in the country.[23] The most desired sex composition of children was two daughters and a son indicating an unambiguous daughter preference.[24]Though, tribal women have more independence and fewer restrictions than women belonging to caste Hindu communities [25], in some states such as Odisha, their status remained low and decision-making regarding issues like seeking health care and large expenditures rested with men.[26] Among the Baiga , a Particularly vulnerable tribal group from Chattisgarh, [27] 61.3% of the women had four or more pregnancies and 61.3% had experienced the loss of child at least once during pregnancy or later compared to a history of abortion among 11.6% only in this study . Even in neighbouring Bangladesh, no preference of son over daughter was observed among tribal communities.[15] Whereas women in Kerala are slightly more likely to use contraception if they already have a son.[10] In Nepal contraceptive use reported by men showed a strong association with number with men favouring to have at least 1 or 2 sons.[28]
Though the Paniya group had lower knowledge scores compared to the other groups, contraceptive use was higher compared to other tribal groups. This may be due to the fact that this is a cross-sectional study and temporal relationships cannot be studied. Spatial (or geographical) isolation is cited as the major reason for the exclusion and backwardness of indigenous com- munities in both China and India.[7] The living conditions are related to an underprivileged background and social vulnerability which may be the reason for the association with low contraceptive use. Living in a kutcha house is also associated with many health problems such as acute respiratory tract infection[29] and soil transmitted parasitic disease. [30] Universal access to family planning services is a part of SDG goal 3.7 and we seem far from achieving that for the indigenous people .

The limitations of the study include that the contraceptive use has been assessed by self reports, though trained local personnel have been used to reduce underreporting as the tribals are reclusive people. This has been corroborated by a repeat study in a smaller sample. All the different tribal /indigenous groups have not been

covered equally due to difficult terrain and the threat of wild elephants. Other ethnographic studies among the various tribal groups are necessary to understand the use of traditional methods of contraception. Some of the data on some variables are missing though it ranges from 3% to 10% only.

Conclusion

Awareness and use of contraceptives are poor though the fertility is not commensurately high. Along with developing targeted responses to contraceptive use among indigenous people with indigenous data,[4] awareness also needs focus. This study shows a higher use of contraceptives among Paniya's, ethnographic studies are necessary to determine the differences in contraceptive use including traditional methods among the various indigenous groups.

Author Contribution

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VijayaKumar K: Design, data collection guidance, analysis and interpretation, editing
Shana Shirin Najeeb: Data collection, drafting the work, analysis
Vishnu B Menon: Data acquisition, analysis, and interpretation of data for the work, Drafting the write up
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Prema Nedungadi: Concept, revising it critically for important intellectual content
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Table1: Sociodemographic distribution of the study population

Variables	Frequency	Percentage
Type of house		
Kutcha	491	20.4
Pucca	1690	70.4
Others	220	9.2
*94 missing		
Tribe		
Paniya	1478	59.2
Kurichiyar	339	13.6
Adiya	273	10.9
Others	405	29.8
Age (in yrs)		
≤31	1303	54
>31	1111	46
*81 missing		
Education		
Illiterate	395	17.2
Literate	1898	82.8
*202 missing		
Occupation		
Employed	1419	69.6
Unemployed	620	30.4
*456 missing		
Marital status		
Currently married	1695	70
Others	725	30

*75 missing		
No: of children		
≤3	1232	85.4
>3	211	14.6
Tobacco usage		
Yes	1436	57..6
No	1059	42.4
Alcohol usage		
Yes	92	3.7
No	2403	96.3
Regular periods		
Yes	2075	83.2
No	420	16.8
Currently pregnant		
Yes	83	3.3
No	2412	96.7
Age at menarche (in years)		
≤13	1428	61.7
>13	886	38.3
*181missing		
Ideal family size		
<=2	1109	47.6
>2	1222	52.4
*164 missing		
Desire for a third child if the first two children are of the same sex		
Yes	1519	68.4
No	703	31.6
*273 missing		
Knowledge general		
Poor	666	53

Good	590	47
Knowledge_OCP		
Poor	28	41.2
Good	40	58.8
Knowledge emergency		
Poor	899	78.4
Good	247	21.6
Ever use of contraceptive		
Yes	658	26.4
No	1837	73.6

Table 2. Determinants of knowledge of contraceptives: Univariate Analysis

		Knowledge levels Good Number(%)	Total	p
Age	≤31yrs	279(44.9%)	622	.121
	>31yrs	294(49.3%)	596	
Education	Illiterate	53(36.1%)	147	.001
	Literate	501(51%)	983	
Occupation				
	Employed	319(45.8%)	26	.015
	Unemployed	188(53.9%)	349	
Tribe	Paniya	66(34.7%)	190	.000
	Kattunaicken	254(41.6%)	610	
	Others	270(59.2%)	456	
Type of house	Kutcha	113(42%)	269	.094
	Pucca	413(49.5%)	835	
	Others	50(50%)	100	
Marital status	Currently married	484(51.3%)	943	.000
	Others	94(33.6%)	280	

No of children ≤3	368(53.6%)	687	.04
>3	49(43%)	114	
Current use of contraceptive			
No	457(49.7%)	919	.001
Yes	133(39.5%)	337	
Tobacco use Yes	269(40.1%)	670	.000
No	321(54.8%)	586	
Alcohol use Yes	9(18.8%)	48	.002
No	581(48.1%)	1208	
Knowledge regarding emergency contraceptives			
Poor	323(37.6%)	859	.00
Good	185(77.7%)	238	
Knowledge regarding oral contraceptives			
Poor	12(42.9%)	28	.61
Good	17(50%)	34	
Attitude			
Poor	127(28%)	520	.00
Good	463(57.7%)	736	

Independent determinants of knowledge of contraceptives	**OR**	**95% CI**	**p**
Education			
Literate	2.22	(1.20,3.98)	.011
Illiterate	1		
Tribe			
Paniya	0.33	(0.17, 0.65)	.001
Kattunaicken	0.7	(0.41, 1.17)	.17
Others	1		
Attitude			
Good	4.88	(3.11,7.65)	.001
Poor	1		
Knowledge regarding emergency contraceptive			
Good	6.9	(3.86,12.36)	.001
Poor	1		
Fertility intention			
Yes	.59	(.38,.94)	.025
No	1		

Table3: Factors affecting current contraceptive use

		Current contraceptive use Yes	Total	p
Age	≤ 31yrs	343(26.3%)	1303	.88
	>31yrs	289(26%)	1111	
Education	Illiterate	84(21.3%)	395	.06
	Others	488(25.7%)	1898	
Tobacco use	Yes	382(26.6%)	1436	.78
	No	276(26.1%)	1059	
Occupation	Employed	378(26.6%)	1419	.017
	Unemployed	134(21.6%)	620	
Alcohol use	Yes	24(26.1)	92	1
	No	634(26.4)	2403	
Age at menarche				
	≤13 yrs	344(24.1)	1428	.001
	>13	270(30.5)	886	
Regular periods	Yes	540(26)	2075	.395
	No	11(28.1)	420	
Knowledge general				
	Poor	204(30.6%)	666	.001
	Good	133(22.5%)	590	
Knowledge of OCP				
	Poor	9(32.1%)	28	.58
	Good	10(25%)	40	
Knowledge of emergency contraceptive				
	Poor	256(28.5%)	899	.023
	Good	52(21.1%)	247	
Attitude				
	Poor	422(29.3%)	1440	.000
	Good	236(22.4%)	1055	
Tribe	Adiya	109(39.9%)	273	.000

Paniya	352(23.8%)	1478	
Others	197(26.5%)	744	
Type of house			
Kutcha	104(21.2%)	491	.004
Others	554(27.6)	2004	
Marital status			
Currently married	415(24.5%)	1695	.013
Others	213(29.4%)	725	
No of children			
≤ 3	295(23.9)	1232	.008
>3	69(32.7)	211	

Independent determinants of current contraceptive use

	Current contraceptive use			
	COR	95% CI P	AOR	95% CI p
Age at menarche(yrs)				
≤ 13	1		1	
>13	1.38	1.145,1.666 .001	1.69	1.14,2.52 0.009
Tribe				
Others	1		1	
Paniya	1.85	1.38,2.47 <.001	2.46	1.54,3.94 <.001
Kattunaicken	0.87	0.71,1.06 .17	0.98	0.67,1.43 .24
Type of house				
Others	1			
Kutcha	.70	.55,.89	.55	.315,.959

	.004	.035

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	4,5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	4,5
Bias	9	Describe any efforts to address potential sources of bias	*6*
Study size	10	Explain how the study size was arrived at	4
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6
		(*b*) Describe any methods used to examine subgroups and interactions	
		(*c*) Explain how missing data were addressed	5
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	6
		(*e*) Describe any sensitivity analyses	
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	4
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	4
		(b) Indicate number of participants with missing data for each variable of interest	8
Outcome data	15*	Report numbers of outcome events or summary measures	5,6,7
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	5,6,7
		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	-
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	-
Discussion			
Key results	18	Summarise key results with reference to study objectives	7
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	9
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	7,8
Generalisability	21	Discuss the generalisability (external validity) of the study results	8
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	2

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Pattern of contraceptive use, determinants and fertility intentions among tribal women in Kerala, India: A cross sectional study

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Title page

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Keywords: Contraceptive use, knowledge, persons of tribal origin, women in the reproductive age group, Kerala

Patient consent form: Patients are in a tribal area in Wayanad in difficult terrain about 12 hours from here. The consent that was obtained at the time of the study can be submitted.

Word count: 4199 (excluding Title page, References, tables)

Supplementary and Raw Data: Will be provided after obtaining permission from the Ministry of Tribal Affairs

Ethics statement: Ethical approval was obtained from the Institutional Ethical Committee IEC-AIMS-2018-COMM-147 dated Sept 22, 2019.

Pattern of contraceptive use, determinants and fertility intentions among tribal women in Kerala, India: A cross sectional study

Abstract

Objectives: To assess pattern of contraceptive use and its determinants, knowledge regarding contraceptives including OCP's and fertility intentions among tribal women in the reproductive age group.

Design: Community based cross sectional study

Setting: Community development blocks in a predominantly tribal district of Wayanad in Kerala, India.

Participants: Women in the reproductive age group (15-49 years) from the tribal groups in the district numbering 2495.

Outcome measures:
Primary: Prevalence of contraceptive use and its determinants
Secondary: Knowledge regarding contraceptives in general, oral contraceptives and fertility intentions.

Results: The mean age of the study participants was 30.8 (SD=9.8 years) and belonged to Paniya (59.2%), Kurichiyar (13.6%) and Adiya (10.9%) tribal groups. Current use of contraceptive was reported by about a fourth 658 (26.4%) (95% CI 27.9,24.9) of women. Following logistic regression, belonging to Paniya tribe (aOR 2.67, 95% CI 1.49,4.77; p<.001), age at menarche >13 yrs (aOR 1.69, 95% CI 1.14,2.52; p<0.009) had significantly higher use of contraceptives whereas social vulnerability as indicated by staying in a kutcha house had a lesser likelihood of use of contraceptive (aOR 0.55, 95% CI .31,.95; p<.03). Oral contraceptive use was low (4.8%) among this population and no abuse was observed.

Less than half (47%) of the respondents had above average knowledge on contraception. Multivariable logistic regression indicated that above average knowledge was 2.2 times more likely with higher education (95% CI 1.2,3.9), lesser among those who desired more than two children (aOR .59;95% CI .38,.94; p<.02).

Two children per family was the preferred choice for 1060 (42.5%) women. No gender bias in favour of the male child was observed.

Conclusion: Targeted responses to contraceptive awareness and use with indigenous data are necessary in view of the low awareness and use. Ethnographic studies are necessary to determine the differences in contraceptive use including traditional methods among the various indigenous groups.

Keywords: Contraceptive use, knowledge, persons of tribal origin, women in the reproductive age group, Kerala

Article Summary
Strengths and Limitations of this study:

Strengths:

- It is a community based study
- Limited studies have been conducted on contraceptive use among indigenous tribal women.

Limitations:

- Spatial or temporal association could not be studied.

Funding statement:
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Competing interest statement:
There are no competing interests

Pattern of contraceptive use, determinants and fertility intentions among tribal women in Kerala, India: A cross sectional study

Introduction

India has one of the largest total population of Indigenous peoples at 104 million second to China's 106.4 million.[1] The data across the world provide evidence of poorer health and social outcomes for Indigenous peoples than for non-Indigenous populations. However, this is not uniformly the case, and the size of the rate difference varies.[2]

Tribal people in independent countries are those "Whose social, cultural, and economic conditions distinguish them from other sections of the national community and whose status is regulated wholly or partly by their own customs or traditions or by special laws or regulations; and peoples in independent countries who are regarded as indigenous because of their descent from the populations who inhabited the country, or a geographical region to which the country belongs, at the time of conquest or colonisation or the establishment of present state boundaries and who, irrespective of their legal status, retain some or all of their own social, economic, cultural, and political institutions".[3]

Among the social groups in India, the tribes are the most socioeconomically deprived groups, with low literacy and poor economic and living conditions.[4] In India, scheduled tribes (ST) refer to various aboriginal ethnic minorities, who are concentrated in hilly lands in the Himalayas, Eastern Ghats, Western Ghats, Deccan Plateau, and other hilly regions.[5] The ST's also referred to as adivasis not only have distinct cultural and linguistic characteristics but are also spatially isolated which is also cited as a reason for deprivation.[6] In addition fertility indices are found to be high. Though, countries such as India, China and Bangladesh, resist the use of the term indigenous groups due to contentions in the definition, they have adopted affirmative action and special measures for the "tribal" or "Adivasi".[7] Several constitutional benefits have been instituted for their upliftment, including various welfare programmes, reserved positions in administration, government bodies and in educational institutions etc but these initiatives appear not to have benefited the entire community.

In India, the southern state of Kerala is home to 0.4% of the total tribal population. The Government of Kerala has identified about 36 scheduled tribes and a majority of them reside in Wayanad district. Till early 1900, the tribals' formed the majority in the district. With the roads built by the British, settlers from the other parts of the state reached the area and displaced the original inhabitants further into forests .[8] They also introduced tobacco and alcohol to the population which they then became dependent on.

In other Latin American and Caribbean countries, coverage with modern contraception (median coverage ratio 0·82, IQR 0·66–0·92), was lower among indigenous women than in the reference group. These differences persisted after adjustment for wealth, education, and residence.[10] Due to all the above reasons and more, the tribes have a very low contraceptive usage and high unmet need for family planning than the other groups.[5] A micro-level study conducted on tribes in south India found low contraceptive usage and high unmet need for family planning among Adiya and Kattunayakan women in Kerala at 68% and 62%.[11] Furthermore, understanding fertility, fertility intentions and contraceptive use can help in the development of population policies. Based on these findings, educational and interventional measures can be carried out to address the prevalent family planning and fertility issues among women.

In the light of sparse knowledge regarding contraceptive use among the tribal groups, this study was initiated with the objective of assessing contraceptive use and its determinants, knowledge regarding contraceptives in general, oral contraceptives and fertility intentions.

Methods

The study was conducted among women belonging to tribal groups in the reproductive age group in two of the three randomly selected Community development blocks of Wayanad in Kerala, India. Two of the three Community Development blocks were randomly selected namely Vythiri/ Kalpetta and Manathavady (Fig1,2).

From a previous study[11] the sample size was calculated to be 1200 per block (details of sample calculation in supplementary file 1). Ethical approval was obtained from the Institutional Ethical Committee IEC-AIMS-2018-COMM-147 dated Sept 22, 2019. Informed video consent was obtained from the study participants.

Considering the cluster size to be a minimum of 30 a total of 40 clusters was selected based on the hPopulation proportionate to size from the two blocks. According to the 2011 census, the total population of tribal origin in the two CD blocks was 46,598. The sampling interval was 1165 and the first number randomly selected was 264 which was ward 1 of Thirunelly Grama Panchayat of Manathavady CD block. Then 40 clusters were selected by adding the sampling interval.

The women in the 15-49year age group were interviewed with a semi structured questionnaire by trained volunteers from the district who underwent a two-day training on contraception, communication skills, rapport building and questionnaire administration from the investigators. A total of 2495 women were interviewed; with 1161 from Kalpetta and 1334 from Manathavady (Fig 2). The qualitative variables are expressed as proportion, percentage and the quantitative as mean and SD. The knowledge scores were then categorized into above average and below average. The missing values were in the range of 3% to 8%. The occupation variable had a larger missing value at 18% and was interpreted with caution.

Settings

A community development block is a rural area administratively earmarked for planning and development[12]. **Pucca House** refers to dwellings with walls made up of burnt bricks, stones, cement concrete etc and the roof made of tiles, asbestos cement sheets, Reinforced Brick Cement, Reinforced Concrete Cement, timber etc. In contrast, a **Kutcha House**, is one with its walls and/or roof made of material other than those mentioned earlier and may include the use of unburnt bricks, bamboos, mud, grass, thatch, loosely packed stones etc. The particularly vulnerable tribal group (PVTG) have been classified by the Government of India and are tribal communities who are characterised by a) forest based livelihoods b) pre-agriculture level of existence c) stagnant or declining population d) extremely low literacy and e) subsistence economy. They consist of Cholanaikayan (a section of Kattunaickans), Kadar, Kattunayakan, Kurumbas and Koraga. [13]

The health services that women have used to access contraception include district hospitals, health centres, health workers and medical shops (over the counter). Other than the medical shops all services are free of cost. All medical care is free of cost to the persons of tribal origin including transport services which is directly reimbursed to the vehicle owner by the Integrated Tribal Development Office (reports from Tribal office and tribal health promoters).

The conceptual framework for the development of the questionnaire (Fig 3) covered the domains of contraceptive use in line with the objectives. The questionnaire has been provided as supplementary file 2. The outcomes studied were contraceptive use, knowledge, attitude regarding contraception and its determinants. Attitude to reproductive rights and contraception is not discussed here. Knowledge question on contraceptives in general and on oral contraceptives, emergency contraception in particular were assessed with a total score of 2.5 for general knowledge questions and 3.75 for oral contraceptives and 1.5 for emergency contraceptive. Those who scored above mean scores, 0.8 for general knowledge on contraceptives, 2.2 for oral contraceptives and 0.2 for emergency contraception were considered to have above average knowledge. The exposure variables for above average knowledge were considered to be age, marital status, education, occupation, type of house, tribe, no of children, tobacco use, alcohol use, age at menarche, current contraceptive use, knowledge regarding emergency contraception, oral contraception, what was considered as the ideal family size. The menstrual history was also assessed along with some associated gynecological symptoms. This was undertaken to determine the relation if any with contraceptive use. The exposure variables of contraceptive use were age, marital status, education, occupation, type of house, tribe, no of children, tobacco use, alcohol use, age at menarche, knowledge in general regarding contraceptives, knowledge regarding emergency contraception, oral contraception and number of children. Multivariate Logistic regression model was developed using the variables age at menarche, occupation, type of tribe, type of house, marital status, no of children, knowledge about contraceptives in general and emergency contraception.

Patient and public involvement

Public participation and involvement of tribal persons was brought about by training and involving the members of the indigenous groups in data collection. Before the training, discussions were carried out with the participants representing the tribal groups and some changes were made in the questionnaire. Discussions and necessary permission were obtained from tribal officers and the study was informed by their experience. Dissemination activities were also carried out.

In order to address the bias due to poor rapport, self-reports of contraceptive use, a repeat study was conducted in a subset (300) to assess the contraceptive prevalence and to determine the presence of menstrual huts which was reported during the initial study, which has not been discussed here. The study was conducted from October 2019-October 2020. A follow up qualitative study was conducted to understand the barriers and facilitators to contraceptive use, fertility intentions, menstrual practices which is beyond the scope of this paper.

Results

The mean age of the study participants was 30.8 (SD=9.8 years). The women belonged to Paniya, Kurichiyar, Adiya tribal groups at 59.2, 13.6 and 10.9 percent respectively. The PVTG constituted 10% of the study population. About 395 (17.2%) were illiterate, a third (33.2%) had 12 years of schooling and about a fifth (19.7%) lived in kutcha houses (Table 1). The mean per capita income was Rs 820.37±1979 from the available responses since members of the community did not reveal their income. The mean age at menarche was 13.21±1.5 years and the mean family size was 4.52±1.62.

Majority of the women 2075 (83.2%) had regular menstrual periods and 97.2% had a menstrual cycle duration of within 45 days. Abdominal pain associated with periods was experienced by 37.5%. The majority (86%) did not experience any bleeding or spotting between periods. The mean duration of menstrual periods was 4.07± 1.33. Only, 4.7% reported that they had bleeding in between periods and 0.4% said that they had bleeding after intercourse. A small proportion, 3.3% of the women in the reproductive age group were currently pregnant. The mean number of children borne to the respondents was 2.34 ± 1.18. About a tenth,11.6% gave a history of abortion and the mean number of abortions was 1.41±1.08. (Table 1)

Initially, only about 41.2% (1027/2495) reported having heard of contraceptives and on further probing this increased to 50.3% (1256/2495). Only more than a third (36.7%) had above average knowledge of contraceptives. Less than a fifth, 433(17.4%) reported having heard of oral contraceptives. Only 68 answered further knowledge questions on OCP of which about a third (33.8%) of the women had above average knowledge. The mean knowledge scores about contraceptives in general, oral contraceptives and about emergency contraception was uniformly low at 0.8 (maximum 2.5), 2.2 (maximum 3.5) and 0.2 (maximum 1.5). Only 206 (8.3%) had heard of emergency contraception and the knowledge regarding emergency contraception was above average among only a fifth, 21.5% (247/1146).

More than a fourth 658 (26.4%) (95% CI 27.9,24.9) of the women reported current use of contraceptive. This was validated by a second study among a subset of 298 reproductive age women where the prevalence of contraceptive use was found to be almost the same at 29%.

Among those who had used contraceptives, a majority 420/658 (63.9%) had used permanent methods and a similar percentage of women had used hormonal contraceptive 57/658 (8.7%), condoms 46/658(7%), 107/658 (16.3 %) used CuT, 14/658 (3.9%) reported using other methods including traditional methods. Nobody reported the use of an injectable hormonal contraceptive. Most of them relied on the Government health system for their contraceptive needs and obtained it from primary health centre, Accredited Social Health activist (ASHA), District hospital and a few from medical shops. The most recent use of contraceptive reported was for family planning more than half of the time 58.6% (237/404), 7.1% (29/404) for religious reasons, 4.9% (20/404) was at the partner's insistence. Despite the current use of contraceptive being only 26%, less than 1% (23/2495) women reported accidental pregnancy. About 39 women (1.6%) reported that they had used emergency contraception.

Among those who reported not to have used a contraceptive, worry about the side effects (13.5%) and partner not wanting to use a method (11.8%) were the main reasons. About 4.8% also mentioned that they did not know how to use the contraceptive method and 7.2% did not need to use a contraceptive method as they were below 18. About a fourth, 26.4% mentioned a variety of reasons for not using such as husband's illness, have decided not to use, have not felt its need, wanted pregnancy, divorced, self-control, need one more child, recently married and not pregnant, natural methods, planning to conceive and planning to do tubectomy, staying away from husband, not staying together with spouse, widow etc.

Regarding oral contraceptives which was a particular focus of this study, about 61.5% had never used oral contraceptives. Most of the users of oral contraceptives 27/58 had only used it sometimes. About a half 28/58(48.2%) used OCP for attending religious rituals for not more than a week and (41.3%)24/58 for

contraceptive use. The most reported side effects were irregularity in menstrual cycle (24.64%) and vomiting (15.94%). Overuse or continuous use of contraceptive for non-contraceptive use was not found, although present in other neighbouring tribal communities[14] and this was also corroborated by the tribal officers of the area.

Determinants of knowledge of contraceptive use

After multivariate logistic regression, the educated were found to have a 2.2 times greater likelihood of above average knowledge (95% CI 1.2,3.9) about contraceptives. Compared to other indigenous groups Paniya's had 67% poorer knowledge (aOR .33 95% CI 0.17,0.65). Though the current use of contraceptive was 1.2 times more likely with above average knowledge, this was not significant. Knowledge of emergency contraception was an important determinant of general knowledge of contraceptives (aOR 6.9,95% CI 3.86,12.36; p<.001).
Though a clustering of risk factors for below average knowledge of contraceptives such as tobacco, alcohol use and illiterate was observed (Table 2a) only education was found to be an independent variable for above average knowledge (aOR 2.2;95% CI 1.2,3.9). Those who desired more than two children irrespective of whether they were boys or girls had significantly lower knowledge (aOR .59;95% CI .38,.94; p<.025) (Table 2b). Others such as age >31years, employed, married women, more than three children having significant association with knowledge disappeared with regression analysis(Table 2a,2b). More than half of the women198(55.6%) in the reproductive age group with above average knowledge said that another child is not required if existing two children belong to the same sex compared to 360(44.8%) in those who said yes(p<.001) indicating no bias for male children.

Determinants of contraceptive use

A binomial logistic regression of the determinants of current use of contraceptive showed that age at menarche >13 years (aOR 1.69, 95% CI 1.14,2.52; p<0.009) and belonging to Paniya tribe had significantly higher use of contraceptive (aOR 2.67, 95% CI 1.49,4.77;p<.001). Though Kattunaickens, a PVTG had lower use of contraceptive this was not significant (Table 3a). Those who stayed in a kutcha house were also less likely to have used a contraceptive (aOR 0.55, 95% CI .31,.95;p<.035)(Table 3b). Though the employed had a higher use of contraceptive in univariate analysis after regression the contraceptive use was significantly lesser among the employed. The final multivariate regression model also included variables such as more than three children, marital status, poorer knowledge scores though significantly associated in the univariate analysis disappeared in the regression analysis done by the enter method (Table 3a,3b). Among the different tribes Kattunaickens', a Particularly vulnerable tribal group had the lowest use of contraceptive at 23.8%, followed by other groups at 26.5% and 39.9% among Paniya's.

A larger proportion of women (42.5%) preferred two children per family, closely followed by (38.2%) women desiring 3 children. The spacing between children suggested was three years by 31.2% and 4 years by 17.8%. There did not appear to be a gender bias in favour of the male child as only 98(3.9%) of women reported that another child was necessary if both the children were girls. Similarly, only about 102(4.1%) reported that another child was necessary if the children were both boys.

Discussion

The current use of contraceptives was reported by 26.4% of indigenous women in the reproductive age group. Knowledge of contraceptives underpins use. The above average knowledge scores were found to be higher among the educated and also aligned with the above average knowledge of emergency contraceptives. Knowledge was lower among those who desired more than two children and among one of the backward tribes, the Paniya's. Contraceptive use was higher among the those belonging to the Paniya tribe and among those with an age of menarche more than 13 years and lesser among those with a kutcha house.

Among the 26.4% contraceptive users, 63.9% used permanent methods, 9% used hormonal contraceptive,7% used condoms, 16.3 % used CuT and 3.9% used other methods including traditional methods. This is much less than that of the state at 53 percent.[15] The contraceptive use varies in other states among the tribals with higher use reported in Assam (36%)[16] and Bengal 40%[17] and varied in the state of Maharashtra from 18.7%[18] to a spacing contraceptive use of 27.7% (10.8% pill, 13.3% condom, 2.0% IUD, 1.6% withdrawal or rhythm).[19]

This also underlines the heterogenous character of the tribal groups across the country varying in population size, language and their interaction with the rest of society[20] and thus having different contraceptive use rates. In neighbouring Bangladesh the contraceptive use among tribals was very high at 73% which was also much higher than among the general population of that country. [21]The primary reason for low contraceptive use may be the low access to contraceptive knowledge and services as observed in Maharashtra and Tamil Nadu.[19 22]. Other reasons could be early child bearing observed among tribal groups in Andhra Pradesh where 10.5% were likely to give birth by the time they were 19 years old[23] which was in turn associated with low contraceptive use [10] and lower education.[22] Other studies in central India substantiated the role of women and husbands' education,[24] age of women, and number of surviving boys in the use of any modern method of contraception.[5] Nevertheless, the different ethnographic backgrounds of the various tribal groups across different parts of India result in a non -uniform pattern of use of contraceptive. The independent determinants of contraceptive use in this study were belonging to the Paniya group and a lower use was observed among those staying in a kutcha house. Though, India as a whole has maintained a steady decline in fertility,[25] studies among tribal communities' report some of the lowest rates of contraceptive use and an increasing fertility rate.[25] Except the scheduled tribes who have a total fertility rate (TFR) of 2.3, the TFR of all population groups in Kerala are below replacement level at 1.6.[15] This also corresponds to the mean number of children in this study at 2.34±1.18. The total fertility rate in central Indian state of Madhya Pradesh among the indigenous tribes was 2.7. [26] Though, the fertility levels in this study are higher than the general population it is not as high as the other tribal communities indicating the use of perhaps other traditional methods such as withdrawal method, calendar method etc which may not have been revealed fully in this cross-sectional study or the influence of the general population. Traditional method uses such as rhythm, withdrawal is the highest in the state in this district at 5.6%. [15] Other reasons could be the high prevalence of reproductive tract infections . The few studies among tribal women on reproductive infection in a southern and northern state of Karnataka and Himachal Pradesh found 12-14% with microbial infection.[27 28]

Reduced contraceptive use may also be due to the difficult access to the health care services. The tribal people rely on the public health system which is in general characterised by low output, low quality and low outcome delivery system. [29] An ethnographic study in an adjoining district showed that the hesitancy to access services inspite of being provided free services and a comprehensive financial protection package was due to the failure to provide culturally respectful care and the lack of power on the part of the indigenous community to negotiate with the health system.[30] In India, across 10 states with sizable tribal population, the percentage surplus/deficit of healthcare providers in tribal areas is found to -33% Allopathic doctors at PHC, and -84% specialists at CHC which depict the huge deficiency of specialist doctors and thus quality healthcare. in the existing primary healthcare system.[29]

Knowledge of contraception is almost universal in Kerala. Among all women, 44 percent knew about emergency contraception.[15] However, in the current study only 36.7% had above average knowledge of contraceptives. This is similar to other studies also with Prusty et al. reporting considerably lower knowledge among tribal women compared to their non-tribal counterparts in the three central Indian states.[5] However, tribal women in the north eastern part of India had good knowledge of contraceptives and correspondingly the contraceptive use was also high.[16] The awareness levels of contraception in general was closely aligned with the awareness of emergency contraceptives (aOR 6.9,95% CI 3.86,12.3) and educational levels (aOR:2.2, 95% CI 1.2,3.9). Findings suggest that lower spacing contraceptive use among tribals is driven by social vulnerabilities such as low education, housing and higher fertility preferences.[19]

Gender norms related to fertility is an important issue determining contraceptive use in the tribal community[27]. Gender relations among Indian tribes have historically been more balanced and equitable; however there is an increasing trend of gender bias in tribal culture emerging due to the assimilation and modernising process[28]. The tribes in Kerala seem to be more equitable with a male child preference not indicated with the desire for a third child expressed when the initial two children are of the same sex. In the north-eastern state of Meghalaya 86% of the population is tribal and follows a matrilineal system. It had the lowest contraceptive use of 20.2% with a

corresponding high total fertility rate of 4.57.[33 34] Though, tribal women have more independence and fewer restrictions than women belonging to caste Hindu communities, in some states such as Odisha, their status remained low and decision-making regarding issues like seeking health care and large expenditures rested with men.[36] Even in neighbouring Bangladesh, no preference of son over daughter was observed among tribal communities.[21] Whereas women in Kerala are slightly more likely to use contraception if they already have a son.[15]

Though the Paniya group had lower knowledge scores compared to the other groups, contraceptive use was higher compared to other tribal groups. This may be due to the fact that the Paniya's a marginalised group among the tribals use more of the public health services [37] and the subcentres which provide family planning services do not incur an additional travel cost. This is a cross-sectional study and temporal relationships between knowledge and use cannot be studied. Spatial (or geographical) isolation is cited as the major reason for the exclusion and backwardness of indigenous com- munities in both China and India.[6] The living conditions, an underprivileged background, and social vulnerability may contribute to low contraceptive use. Universal access to family planning services, aligned with SDG goal 3.7, data suggests that we are far from achieving this goal when it comes to tribal communities.

A limitation of the study is that the contraceptive use has been assessed through self- reports, though trained local personnel were able to reduce underreporting as the tribals are shy and reclusive. This conclusion has been corroborated by a repeat study using a smaller sample. Though, the findings are generalisable to the tribal as a whole, the different tribal /indigenous groups have not been covered equally due to difficult terrain and the possibility of human-wildlife conflict. Other ethnographic studies among the various tribal communities are necessary to understand the use of traditional methods of contraception. Data related to some variables are missing though it is negligible, ranging from 3% to 10% .

Though the Paniya group had lower knowledge scores compared to the other groups, contraceptive use was higher compared to other tribal groups. This may be due to the fact that the Paniya's, a marginalised group among the tribals, use more of the public health services. [37] Visit to the subcentres that provided family planning services do not impose an additional travel cost. This is a cross-sectional study and temporal relationships between knowledge and use cannot be studied. Spatial (or geographical) isolation is cited as the major reason for the exclusion and backwardness of indigenous communities in both China and India.[6] The living conditions, an underprivileged background, and social vulnerability may contribute to low contraceptive use.

Thus, at a policy level more changes are necessary. Inspite of the numerous schemes and support such as Tribal Health promoter, Oorumithram (friend of the village) there is a huge gap in understanding the tribal persons belonging to different groups. A more culturally sensitive and respectful approach is necessary. Universal access to family planning services, aligned with SDG goal 3.7, data suggests that we are far from achieving this goal when it comes to tribal communities.

Conclusion

Awareness and use of contraceptives are poor though the fertility is not commensurately high. Along with developing targeted responses to contraceptive use among indigenous people with indigenous data[3], awareness also requires attention. This study shows a higher use of contraceptive among Paniya's, ethnographic studies are necessary to determine the differences in contraceptive use including traditional methods among the various indigenous groups.

Author Contribution

Aswathy S: Concept, design, data collection, analysis and interpretation, writing up
VijayaKumar K: Design, data collection guidance, analysis and interpretation, editing
Shana Shirin Najeeb: Data collection, drafting the work, analysis
Vishnu B Menon: Data acquisition, analysis, and interpretation of data for the work, Drafting the write up
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Prema Nedungadi: Concept, revising it critically for important intellectual content
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Fig 1: Selection of sample and sample size

Fig 2: Map of the area

Fig 3: Conceptual framework for the development of questionnaire

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Table1: Sociodemographic distribution of the study population

Variables	Frequency	Percentage
Type of house		
Kutcha	491	20.4
Pucca	1690	70.4
Others	220	9.2
*94 missing		
Tribe		
Paniya	1478	59.2
Kurichiyar	339	13.6
Adiya	273	10.9
Others	405	29.8
Age (in years)		
≤31	1303	54
>31	1111	46
*81 missing		
Education		
Illiterate	395	17.2
Literate	1898	82.8
*202 missing		
Occupation		
Employed	1419	69.6
Unemployed	620	30.4
*456 missing		
Marital status		

Currently married	1695	70
Others	725	30
*75 missing		
No: of children		
≤3	1232	85.4
>3	211	14.6
Tobacco usage		
Yes	1436	57..6
No	1059	42.4
Alcohol usage		
Yes	92	3.7
No	2403	96.3
Regular periods		
Yes	2075	83.2
No	420	16.8
Currently pregnant		
Yes	83	3.3
No	2412	96.7
Age at menarche (in years)		
≤13	1428	61.7
>13	886	38.3
*181missing		
Ideal family size		
<=2	1109	47.6
>2	1222	52.4
*164 missing		
Desire for a third child if the first two children are of the same sex		
Yes	1519	68.4
No	703	31.6
*273 missing		

Knowledge - General		
Below Average	666	53
Above Average	590	47
Knowledge - OCP		
Below Average	28	41.2
Above Average	40	58.8
Knowledge - Emergency Contraception		
Below Average	899	78.4
Above Average	247	21.6
Ever use of contraceptive		
Yes	658	26.4
No	**1837**	**73.6**
Type of contraceptive used		
Permanent	**420**	**58.6**
Hormonal (OCP)	**57**	**18.6**
Condoms	**46**	**18.6**
CuT	**107**	**4.5**
Others including Traditional methods	**14**	**0.8**

Table 2a. Determinants of knowledge of contraceptives: Univariate Analysis

		Knowledge levels Above Average (%)	Total	p value
Age	≤31yrs	279(44.9%)	622	.121
	>31yrs	294(49.3%)	596	
Education	Illiterate	53(36.1%)	147	.001
	Literate	501(51%)	983	

Occupation				
	Employed	319(45.8%)	26	.015
	Unemployed	188(53.9%)	349	
Tribe	Paniya	66(34.7%)	190	.000
	Kattunaicken	254(41.6%)	610	
	Others	270(59.2%)	456	
Type of house	Kutcha	113(42%)	269	.094
	Pucca	413(49.5%)	835	
	Others	50(50%)	100	
Marital status	Currently married	484(51.3%)	943	.000
	Others	94(33.6%)	280	
No of children	≤3	368(53.6%)	687	.04
	>3	49(43%)	114	
Current use of contraceptive				
	No	457(49.7%)	919	.001
	Yes	133(39.5%)	337	
Tobacco use	Yes	269(40.1%)	670	.000
	No	321(54.8%)	586	
Alcohol use	Yes	9(18.8%)	48	.002
	No	581(48.1%)	1208	
Knowledge regarding emergency contraceptives				
	Below Average	323(37.6%)	859	.00
	Above Average	185(77.7%)	238	
Knowledge regarding oral contraceptives				
	Below Average	12(42.9%)	28	.61
	Above Average	17(50%)	34	
Attitude				
	Below Average	127(28%)	520	.00
	Above Average	463(57.7%)	736	

Table 2b: Independent determinants of above average knowledge of contraceptives

	cOR	**95% CI**	**p**	**aOR**	**95% CI**	**p**
Education						
Literate	1.84	1.28,2.64	.001	2.22	(1.23,3.98)	.011
Illiterate	1			1		

Tribe							
	Paniya	.36	.26, .52	.001	0.33	(0.17, 0.65)	.001
	Kattunaicken	.49.	.38, .62	.01	0.7	(0.41, 1.17)	.17
	Others	1.			1		
Occupation							
	Employed.	0.72	.55,.93	.014	1.004.	(.65,1.55)	.98
	Unemployed	1			1		
Attitude							
	Good	3.49.	2.72,4.48		4.88	(3.11,7.65)	.001
	Poor.	1					
Marital status							
	Ever married.	2.08(1.57,2.75)		0.01	.65(.325,1.32).		.242
	Others	1					
Tobacco Use							
	Yes	.55(.44,.69)		0.01	.67(.41,1.086)		.104
	No	1			1		
Alcohol use							
	Yes	.25(.12,.52)		0.01	.56(.11,3.05).		.507
	No	1			1		
Ever use of contraceptive							
	Yes	.66(.51,.85)		0.01.	1.24(.75,2.06).		.40
	No	1			1		
Knowledge regarding emergency contraceptive							
	Above Average	5.79(4.14,8.09)		.001	6.9 (3.86,12.36)		.001
	Below Average	1					
No of children							
	>3	.65(.44,.97)		.037	1.07(.58,1.96).		.815
	<3	1			1		
Fertility intention							
	Yes	.65(.50,.83)		.001	.59 (.38,.94)		.025
	No	1					

Table 3a: Factors affecting current contraceptive use

		Current contraceptive use		
		Yes	Total	p
Age	≤31yrs	343(26.3%)	1303	.88
	>31yrs	289(26%)	1111	
Education	Illiterate	84(21.3%)	395	.06

	Others	488(25.7%)	1898	
Tobacco use	Yes	382(26.6%)	1436	.78
	No	276(26.1%)	1059	
Occupation	Employed	378(26.6%)	1419	.017
	Unemployed	134(21.6%)	620	
Alcohol use	Yes	24(26.1)	92	1
	No	634(26.4)	2403	
Age at menarche				
	≤13 yrs	344(24.1)	1428	.001
	>13	270(30.5)	886	
Regular periods	Yes	540(26)	2075	.395
	No	11(28.1)	420	
Knowledge general				
Below Average		204(30.6%)	666	.001
Above Average		133(22.5%)	590	
Knowledge of OCP				
Below Average		9(32.1%)	28	.58
Above Average		10(25%)	40	
Knowledge of emergency contraceptive				
Below Average		256(28.5%)	899	.023
Above Average		52(21.1%)	247	
Attitude				
	Poor	422(29.3%)	1440	.000
	Good	236(22.4%)	1055	
Tribe	Paniya	109(39.9%)	273	.000
	Kattuunaicken	352(23.8%)	1478	
	Others	197(26.5%)	744	
Type of house				
	Kutcha	104(21.2%)	491	.004
	Others	554(27.6)	2004	
Marital status				
	Currently married	415(24.5%)	1695	.013
	Others	213(29.4%)	725	
No of children				

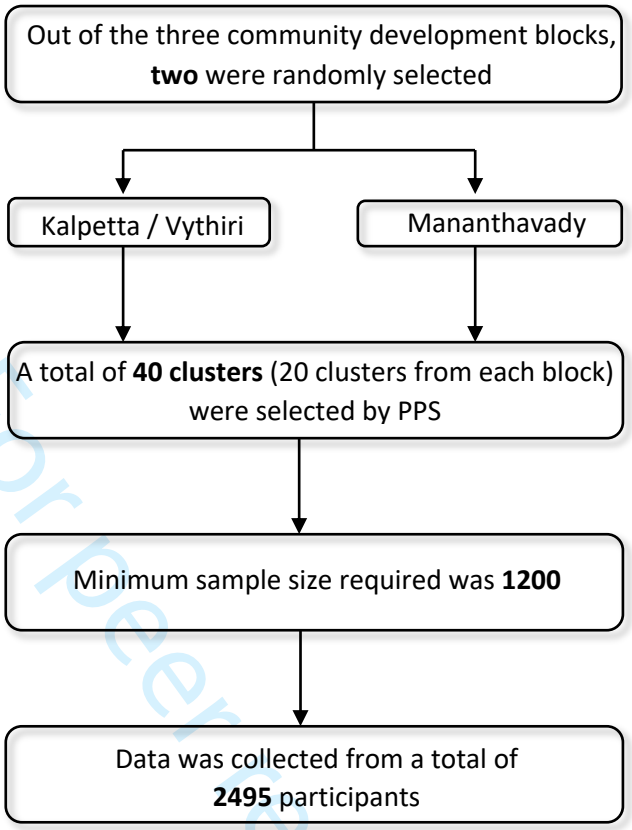
≤3	295(23.9)	1232		.008
>3	69(32.7)	211		

Table 3b: Independent determinants of current contraceptive use

	Current contraceptive use			
	COR	95% CI p	AOR	95% CI p
Age at menarche (years)				
≤13	1		1	
>13	1.38	1.145,1.666 .001	1.69	1.14,2.52 0.009
Tribe				
Others	1		1	
Paniya	1.85	1.38,2.47 <.001	2.46	1.54,3.94 <.001
Kattunaicken	0.87	0.71,1.06 .17	0.98	0.67,1.43 .24
Occupation				
Employed	1.32.	1.05,1.65 0.016	0.59	0.38,0.9 .015
Unemployed	1		1	
Type of house				
Others	1			
Kutcha	.70	.55,.89 .004	.55	.315,.959 .035
Marital status				
Evermarried	0.77	.64,.94 .012	.85.	.422,1.71 .65
Others	1		1	
No of children				
>3	1.54.	1.12,2.11 .007	1.22.	.69,2.16 .48
≤3.	1		1	
Knowledge - General				

Above average	0.65	.51,.85 .001.	.93	.58,1.47 .75
Below average	1.		1	
Knowledge - Emergency Contraceptive				
Above average	0.67	.47,.94.	.86	.50,1.49
Below average.	1	.02	1	0.614

Fig 1. Selection of sample and sample size



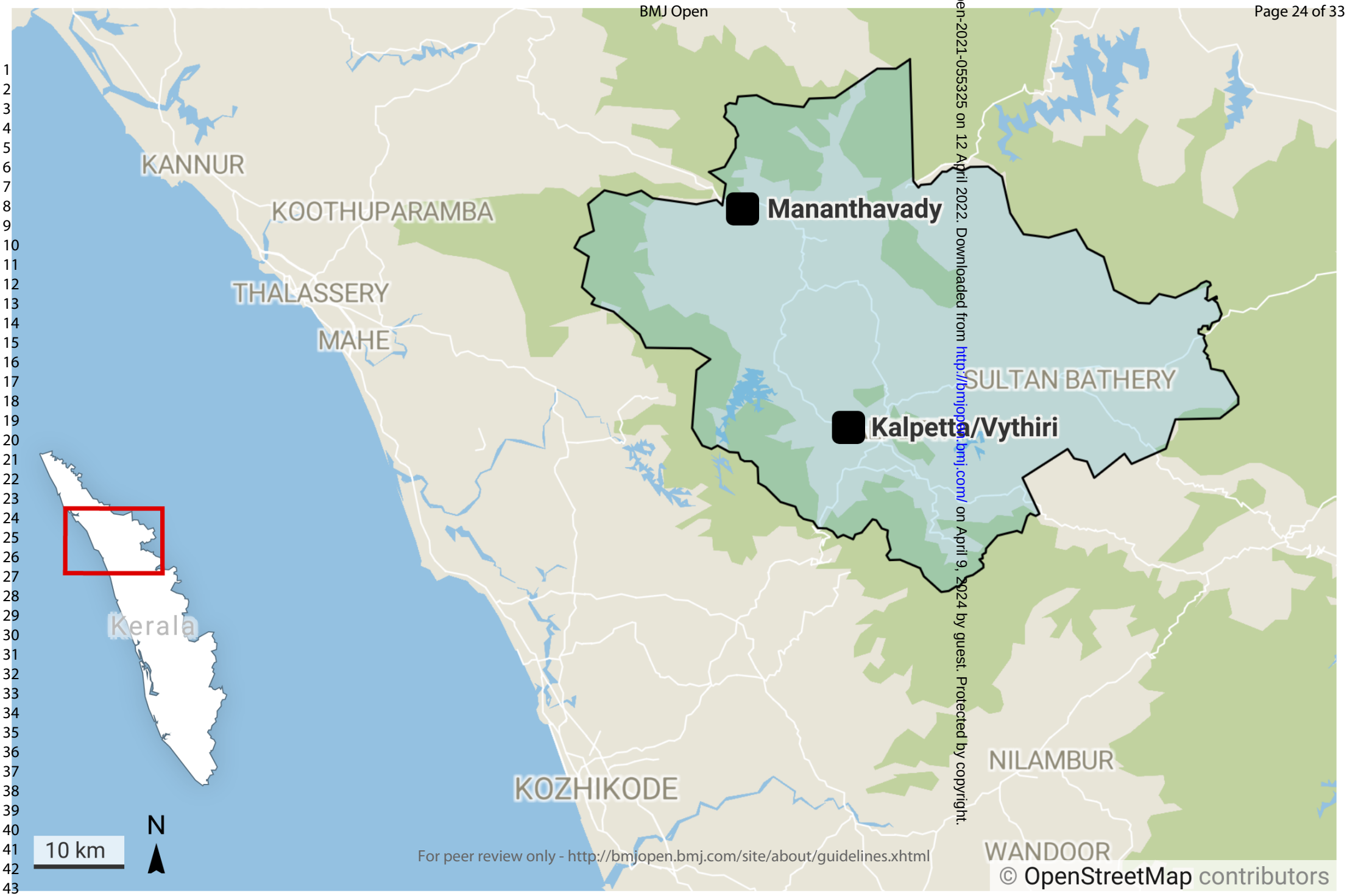
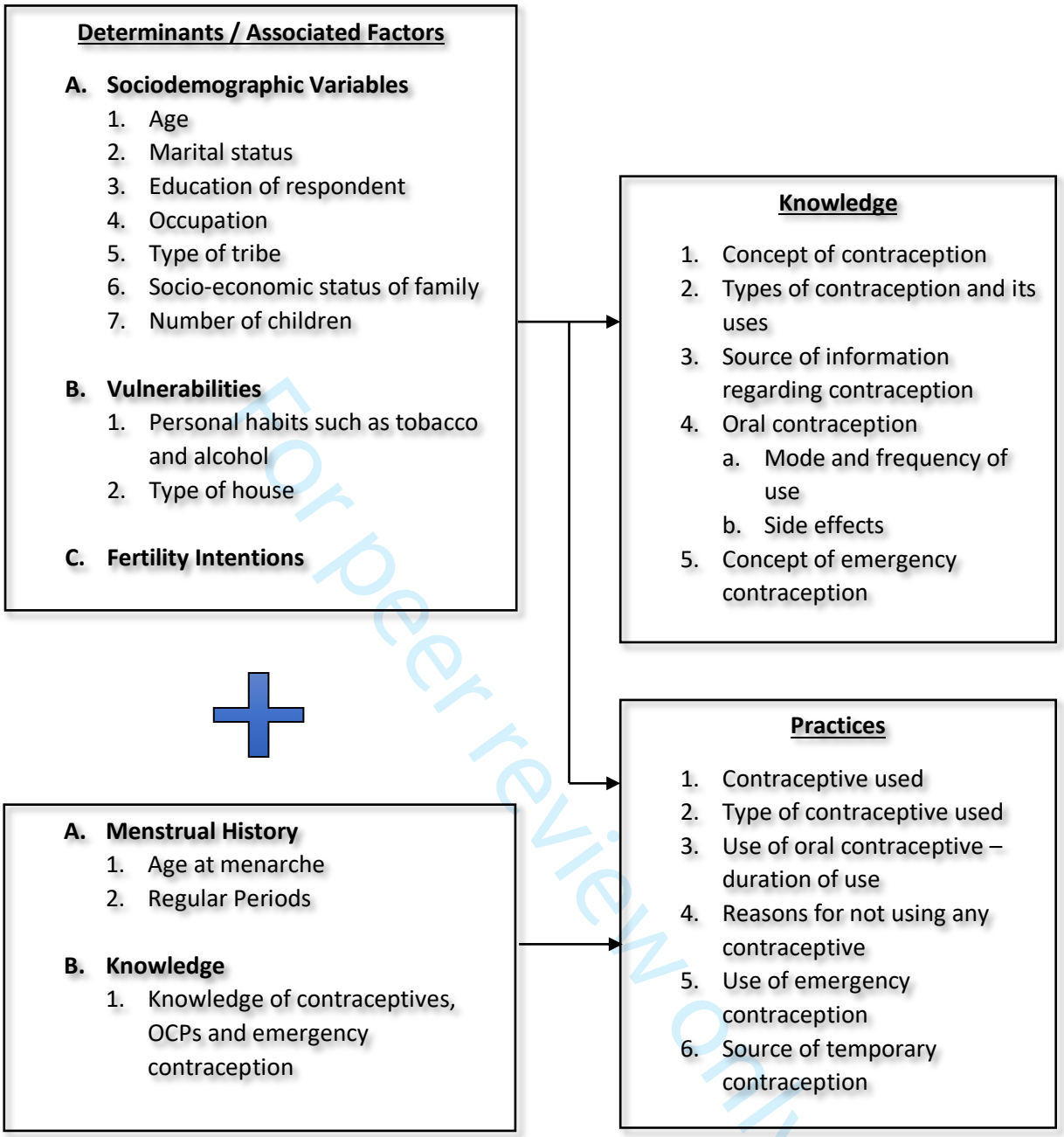


Fig 3. Conceptual framework for the development of Questionnaire



Supplement – 1
Sample size calculation

According to a study conducted in Wayanad the contraceptive use among tribals of Wayanad was 40.7%.[9] With 95% confidence interval and 10% relative precision using the formula (Z1-alpha/2) pq/d2 the sample size was calculated to be 583. With a design effect of 2 a final sample size of 1166 was obtained rounded to 1200 for each block.

Pattern of contraceptive use, determinants and fertility intentions among tribal women in Kerala, India: A cross sectional study

1. Sl no:
2. Phone no:
3. Ward:
4. Panchayat
5. CD block
6. Age:
7. What is your highest level of education (woman in the reproductive age group)
   a) Literate b) Illiterate c) Primary d) Graduate/Post Graduate

8. What is your occupation a) Coolie b) Traditional work c) Housewife d) Professional e) Others-specify
9. Income

Sl no	Family members	Income	
Total no of members		Family income	Percapita income

10. Type of house a) Kucha b) Pucca c) Others (specify)

11. Tribal group: a) Adiya b) Paniya c) Kattunaikkan d) Kurichiyan e) Oorali kuruma

f) Others (Specify)

Personal Information

12. Marital status a) Married b) Divorce c) Widow d) Not married e) Separated

f) Unmarried mother

13. In the last one month have you used any tobacco product such as Beedi/ Cigarette / Chewing tobacco) ? a) Yes b) No

14. Have you used alcohol in the past one month? a) Yes b) No

Menstrual History

15. Age of attainment of menarche

16. a) Is your menstrual cycles regular? a) Yes b) No

    b) How frequently does your menstruation cycles occur? ----------days

17. How many days your cycle last? ----------days

18. Do you have dysmenorrhea? a) Yes b) No

19. Do you have intermenstrual bleeding/spotting? a) Yes b) No

20. Ask married woman above 18 yrs: After sexual contact do you have bleeding/spotting?

a) Yes b) No c) Not Applicable(for unmarried woman below 18 yrs)

21. Last menstrual period----------(day/month/year)

Obstetric history (Ask to those who were pregnant for at least one time)

22. Are you pregnant now? a) Yes b) No

23. If yes how many times have you been pregnant? (Including current pregnancy)

24. How many newborns (who have completed 7 months/28 weeks of gestation have you given birth to ?

25. How many children do you have?

26. a) History of abortions? a) Yes b) No

b) If yes how many?

27. What type of abortion was the last one ?

a) Modern medical technique b) Traditional c) Natural d) Others (specify)

Knowledge of contraceptives

28. Have you heard about contraceptives a) Yes b) No

29. If yes, what was your source of information about contraception?

(Multiple responses)

a) Friends/Relatives b) Media/Print c) Health workers d) Doctors

e) Others (specify)

30. What does the term contraceptive methods mean ?

31. Which all contraceptive methods are you aware of ? (If there is no response ,pl probe) (Multiple responses)

a) Hormonal pills/ Injectables b) IUD c) Condom (Nirodh) d) Others (specify)

32. Have you heard about oral contraceptive pills? a) Yes b) No (If no go to Q 37)

33. How should the tablets that are a part of the oral contraceptive pills be taken? (How many days after periods)

a) 1st day b) 5th day c) 10th day d) Don't know

34. How frequently should oral contraceptive pills be taken?

a) Daily b) Alternate days c) Weekly once d) Monthly once e) Don't know f) Others specify

35. How many tablets are there in a pack of oral contraceptive pills?

36. What are the side effects of oral contraceptive pills?

a) Infertility b) Irregular periods c) Obesity d) Vomiting e) No side effects f) Don't know g) Others specify

37. Have you heard about emergency contraception? a) Yes b) No

38. What do you understand by the term emergency contraception?

39. Can emergency contraception be a substitute for regular contraception methods? a) Yes b) No c) Don't know

40. Do you think contraceptive methods are completely effective in preventing pregnancy? a) Yes b) No c) Don't know

Attitude

Please mark against each statement the attitude which corresponds to the viewpoint of f the respondent

		Strongly agree	Agree	Don't know	Disagree	Strongly disagree
41	Females should take an active role in the use of contraceptive methods					
42	Females and males have equal role in taking decisions on use of contraceptives					
43	Opinion regarding sexual intercourse without female partners consent					
44	Opinion regarding Sexual contact among adolescents before 18 years of age					
45	Opinion regarding pre-marital sex					
46	Use of contraception by unmarried woman is against woman's morality					
47	Emergency contraception can be used routinely like other contraceptive methods					
48	Contraceptive pills can be used for longer duration (>3 months) to prevent pregnancy					
49	Contraceptive pills can be used for more than 3 months for treatment of menstrual disorders					
50	Contraceptive pills can be used for long duration (>3 months) for delaying menstrual cycle					
51	Contraceptive pills can be used for prolonged periods so that you don't have to follow the practice of staying in "Valaymapura"					

Practices

52. Have you ever used any contraceptive methods?

a) Yes b) No If no go to Q 59

53. Are you currently (within the past one month) using a contraceptive method?

a) Yes b) No

54. Which of the following contraceptive measures are you using?

a) Condom b) Oral pills c) Cu T d) Permanent sterilization e) Others specify

55. Condom----------how many months of use

Oral pills----------how many months of use

CuT----------how many months of use (one that you used last)

56. If you have used any temporary method of contraception, from where did you get it?

57. Why did you choose the contraceptive method which you have used recently?

a) To avoid unwanted pregnancy b) To attend religious function c) By partners compulsion d)Don't know e) Not applicable

58. Did you have any unplanned pregnancy? a) Yes b) No c) Don't know

59. Have you used any emergency contraceptive methods? a) Yes b) No c) Don't know

60. Reasons for not using any contraceptive methods?

a) Infrequent sexual contacts wouldn't result in pregnancy

b) Contraceptive methods are expensive

c) Worried about side effects

d) Partners disinterest in contraceptive method usage

e) Discomfort in buying contraceptive methods

f) Use of contraceptive methods results in decrease in pleasure during contact

g) Don't know how to use contraceptives

h) No sexual contacts

i) Others (specify)

61. How often have you used oral pills?

a) Always b) Many times c) Rarely d) Once in a while e) Not used

62. If answer is a) what is the reason for continuous use of oral contraceptive pills regularly?

a) To avoid unwanted pregnancy b) b) To attend religious function c) By partners

compulsion d) Don't know e) To avoid going to Valaymapura (Menstrual hut)

63. Have you experienced any side effects after using oral pills? a) Yes b) No

64. If yes, which of the following

a) Infertility b) Irregular periods c) Increase in body weight d) Vomiting e) No side effects f) Others (specify)

65. According to you how many children should be there in a family?

66. What should be the required age gap between 2 children?

67. Does a family with 2 male child/female child require one more child?

a) Only for family with 2 girl child b) Only for family with 2 male child c) in both cases d) not required for a and b

Filled by - Name:

Sign:

Verified by:

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	5,6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5,6,7
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6
		(*b*) Describe any methods used to examine subgroups and interactions	
		(*c*) Explain how missing data were addressed	6
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	6
		(*e*) Describe any sensitivity analyses	
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	6
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	22
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7
		(b) Indicate number of participants with missing data for each variable of interest	14
Outcome data	15*	Report numbers of outcome events or summary measures	7,8
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	17,18
		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	-
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	-
Discussion			
Key results	18	Summarise key results with reference to study objectives	8,9,10
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	10
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	8,9,10
Generalisability	21	Discuss the generalisability (external validity) of the study results	10
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	2

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Pattern of contraceptive use, determinants and fertility intentions among tribal women in Kerala, India: A cross sectional study

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Title page

Pattern of contraceptive use, determinants and fertility intentions among tribal women in Kerala, India: A cross- sectional study

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Keywords: Contraceptive use, knowledge, persons of tribal origin, women in the reproductive age group, Kerala

Patient consent form: Patients are in a tribal area in Wayanad in difficult terrain about 12 hours from here. The consent that was obtained at the time of the study can be submitted.

Word count: 4141 (excluding Title page, References, tables)

Supplementary and Raw Data: No additional data available

Ethics statement: Ethical approval was obtained from the Institutional Ethical Committee IEC-AIMS-2018-COMM-147 dated Sept 22, 2019.

Pattern of contraceptive use, determinants and fertility intentions among tribal women in Kerala, India: A cross- sectional study

Abstract

Objectives: To assess the pattern of contraceptive use and its determinants, knowledge regarding contraceptives including oral contraceptive pills (OCP's) and fertility intentions among tribal women in the reproductive age group.

Design: Community based cross- sectional study

Setting: Community development blocks in a predominantly tribal district of Wayanad in Kerala, India.

Participants: Women in the reproductive age group (15-49 years) from the tribal groups in the district numbering 2495.

Outcome measures:
Primary: Prevalence of contraceptive use and its determinants
Secondary: Knowledge regarding contraceptives in general, oral contraceptives and fertility intentions.

Results: The mean age of the study participants was 30.8 years (Standard deviation=9.8) and belonged to various tribal groups such as Paniya (59.2%), Kurichiyar (13.6%) and Adiya (10.9%). Current use of contraceptive was reported by about a fourth 658 (26.4%) (95% CI 27.9,24.9) of women. Following logistic regression, belonging to Paniya tribe (aOR 2.67, 95% CI 1.49,4.77; p<.001) and age at menarche >13 yrs (aOR 1.69, 95% CI 1.14,2.52; p<0.009) had significantly higher use of contraceptives whereas social vulnerability as indicated by staying in a kutcha house had a lesser likelihood of use of contraceptive (aOR 0.55, 95% CI .31,.95; p<.03). Oral contraceptive use was low (4.8%) among this population and no abuse was observed.

Less than half (47%) of the respondents had an above average knowledge on contraception. Multivariable logistic regression indicated that above average knowledge was 2.2 times more likely with higher education (95% CI 1.2,3.9), lesser among those who desired more than two children (aOR .59;95% CI .38,.94; p<.02).

Two children per family was the preferred choice for 1060 (42.5%) women. No gender bias in favour of the male child was observed.

Conclusion: Awareness and use of contraceptives are poor though the fertility is not commensurately high. Along with developing targeted responses to contraceptive use among indigenous people with indigenous data, awareness also requires attention. Ethnographic studies are also necessary to determine the differences in contraceptive use including traditional methods among the various indigenous groups.

Keywords: Contraceptive use, knowledge, persons of tribal origin, women in the reproductive age group, Kerala

Article Summary

Strengths and Limitations of this study:

Strengths:

- It is a community-based study
- Limited studies have been conducted on contraceptive use among indigenous tribal women.

Limitations:

- Spatial or temporal association could not be studied.

Funding statement:
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Competing interest statement:
There are no competing interests

Pattern of contraceptive use, determinants and fertility intentions among tribal women in Kerala, India: A cross- sectional study

Introduction

India is home to one of the largest population of Indigenous persons at 104 million second to China's 106.4 million.[1] Global data is replete with evidence of poorer health and social outcomes for Indigenous peoples than for non-Indigenous populations. However, this is not uniformly the case, and the size of the rate difference varies.[2]

Tribal people in independent countries are those "Whose social, cultural, and economic conditions distinguish them from other sections of the national community and whose status is regulated wholly or partly by their own customs or traditions or by special laws or regulations; and peoples in independent countries who are regarded as indigenous because of their descent from the populations who inhabited the country, or a geographical region to which the country belongs, at the time of conquest or colonisation or the establishment of present state boundaries and who, irrespective of their legal status, retain some or all of their own social, economic, cultural, and political institutions".[3]

Among the various social groups in India, the tribes are the most socioeconomically deprived groups, with low literacy and poor economic and living conditions.[4] In India, scheduled tribes (ST) refer to various aboriginal ethnic minorities, who are concentrated in hilly lands in the Himalayas, Eastern Ghats, Western Ghats, Deccan Plateau, and other hilly regions.[5] The STs, also referred to as Adivasis not only have distinct cultural and linguistic characteristics but are also spatially isolated which is also cited as a reason for deprivation.[6] In addition fertility indices are found to be high. Though, countries such as India, China and Bangladesh, resist the use of the term indigenous groups due to contentions in the definition, they have adopted affirmative action and special measures for the "tribal" or "Adivasi".[7] Several constitutional benefits have been instituted for their upliftment, including various welfare programmes, reserved positions in administration, government bodies and in educational institutions etc but these initiatives appear not to have benefited the entire community.

In India, the southern state of Kerala is home to 0.4% of the total tribal population. The Government of Kerala has identified about 36 scheduled tribes and a majority of them reside in Wayanad district. Till early 1900, they formed the majority in the district. With the roads built by the British, settlers from the other parts of the state reached the area and displaced the original inhabitants further into forests .[8] They also introduced tobacco and alcohol to the population which they then became dependent on.[9,10]

In other Latin American and Caribbean countries, coverage with modern contraception (median coverage ratio 0·82, IQR 0·66–0·92), was lower among indigenous women than in the reference group. These differences persisted after adjustment for wealth, education, and residence.[11] Due to all the above reasons and more, the tribes have a very low contraceptive usage and high unmet need for family planning than the other groups.[5] A micro-level study conducted among Adiya and Kattunayakan tribes in Kerala found low contraceptive usage and high unmet need for family planning at 68% and 62% respectively.[12] Furthermore, understanding fertility, fertility intentions and contraceptive use can help in the development of population policies. Based on these findings, educational and interventional measures can be carried out to address the prevalent family planning and fertility issues among women.

In the light of sparse knowledge regarding contraceptive use among the tribal groups, this study was initiated to assess contraceptive use and its determinants, knowledge regarding contraceptives in general, oral contraceptives and fertility intentions.

Methods

The study was conducted among women belonging to tribal groups in the reproductive age group in two of the three randomly selected Community development (CD) blocks of Wayanad in Kerala, India namely Vythiri/ Kalpetta and Manathavady. (Fig1,2).

From a previous study[12] the sample size was calculated to be 1200 per block (details of sample calculation in supplementary file 1). Ethical approval was obtained from the Institutional Ethical Committee IEC-AIMS-2018-COMM-147 dated Sept 22, 2019. Informed video consent was obtained from the study participants.

Considering the cluster size to be a minimum of 30, a total of 40 clusters were selected from the two blocks based on the Population proportionate to size sampling. According to the 2011 census, the total population of tribal origin in the two CD blocks was 46,598. The sampling interval was 1165 and the first number randomly selected was 264 which was ward 1 of Thirunelly Grama Panchayat of Manathavady CD block. Then 40 clusters were selected by adding the sampling interval.

The women in the 15-49year age group were interviewed with a semi- structured questionnaire by trained volunteers from the district who underwent a two-day training on contraception, communication skills, rapport building and questionnaire administration. A total of 2495 women were interviewed; with 1161 from Kalpetta and 1334 from Manathavady (Fig 2). The qualitative variables are expressed as proportion, percentage and the quantitative as mean and SD. The knowledge scores were then categorized into above average and below average. The missing values were in the range of 3% to 8%. The occupation variable had a larger missing value at 18% and was interpreted with caution.

Settings

A CD block is a rural area administratively earmarked for planning and development.[13] **Pucca House** refers to dwellings with walls made up of burnt bricks, stones, cement concrete etc and the roof made of tiles, asbestos cement sheets, Reinforced Brick Cement, Reinforced Concrete Cement, timber etc. In contrast, a **Kutcha House**, is one with its walls and/or roof made of material other than those mentioned earlier and may include the use of unburnt bricks, bamboos, mud, grass, thatch, loosely packed stones etc. The particularly vulnerable tribal group (PVTG) have been classified by the Government of India and are tribal communities who are characterised by a) forest based livelihoods b) pre-agriculture level of existence c) stagnant or declining population d) extremely low literacy and e) subsistence economy. They consist of Cholanaikayan (a section of Kattunaickans), Kadar, Kattunayakan, Kurumbas and Koraga. [14]

The healthcare services that women have used to access contraception include district hospitals, health centres, health workers and medical shops (over the counter). Other than the medical shops all services are free of cost. All medical care is free of cost to the persons of tribal origin including transport services which is directly reimbursed to the vehicle owner by the Integrated Tribal Development Office (as reported from Tribal office and tribal health promoters).

The conceptual framework for the development of the questionnaire (Fig 3) consisted of domains of contraceptive use in line with the objectives such as contraceptive use, knowledge, attitude regarding contraception and its determinants. The questionnaire has been provided as supplementary file 2. Attitude to reproductive rights and contraception is not discussed here. Questions on knowledge regarding contraceptives in general and on oral contraceptives, emergency contraception in particular were assessed with a total score of 2.5 for general knowledge questions, 3.75 for oral contraceptives and 1.5 for emergency contraceptive. Those who scored above mean scores, 0.8 for general knowledge on contraceptives, 2.2 for oral contraceptives and 0.2 for emergency contraception were considered to have above average knowledge. The independent variables for above average knowledge were considered to be age, marital status, education, occupation, type of house, tribe, no of children, tobacco use, alcohol use, age at menarche, current contraceptive use, knowledge regarding emergency contraception, oral contraception and concept of ideal family size. The menstrual history was also assessed along with some associated gynecological symptoms in order to determine the relation, if any, with contraceptive use. The independent variables of contraceptive use were age, marital status, education, occupation, type of house, tribe, no of children, tobacco use, alcohol use, age at menarche, knowledge in general regarding contraceptives, knowledge regarding emergency contraception, oral contraception and number of children. Multivariate Logistic regression model was developed using the variables age at menarche, occupation, type of tribe, type of house, marital status, no of children, knowledge about contraceptives in general and emergency contraception.

Patient and public involvement

Public participation and involvement of tribal persons was brought about by training and involving the members of the indigenous groups in data collection. Before the training, discussions were carried out with the participants representing the tribal groups and some changes were made in the questionnaire. Discussions and necessary permission were obtained from tribal officers and the study was informed by their experience. Dissemination activities were also carried out.

In order to address the bias due to poor rapport, self-reports of contraceptive use, a repeat study was conducted in a subset (300) to assess the contraceptive prevalence and to determine the presence of menstrual huts which was reported during the initial study, which has not been discussed here. The study was conducted from October 2019-October 2020. A follow up qualitative study was conducted to understand the barriers and facilitators to contraceptive use, fertility intentions, menstrual practices which is beyond the scope of this paper.

Results

The mean age of the study participants was 30.8 (SD=9.8 years). The women belonged to Paniya, Kurichiyar, Adiya tribal groups at 59.2, 13.6 and 10.9 percent respectively. The PVTG constituted 10% of the study population. About 395 (17.2%) persons were illiterate, a third (33.2%) had 12 years of schooling and about a fifth (19.7%) lived in kutcha houses (Table 1). The mean per capita income was $10.66± 25.72 from the available responses since many respondents did not reveal their income. The mean age at menarche was 13.21±1.5 years and the mean family size was 4.52±1.62.

Majority of the women 2075 (83.2%) had regular menstrual periods and 97.2% had a menstrual cycle duration of less than 45 days. Abdominal pain associated with periods was experienced by 37.5% of the participants. The majority (86%) did not experience any bleeding or spotting between periods. The mean duration of menstrual periods was 4.07± 1.33. Only, 4.7% reported that they had bleeding in between periods and 0.4% said that they had bleeding after intercourse. A small proportion, 3.3% of the women in the reproductive age group were currently pregnant. The mean number of children borne to the respondents was 2.34 ± 1.18. About a tenth,11.6% gave a history of abortion and the mean number of abortions was 1.41±1.08. (Table 1)

Initially, only about 41.2% (1027/2495) reported having heard of contraceptives and on further probing this increased to 50.3% (1256/2495). Only more than a third (36.7%) had above average knowledge of contraceptives. Less than a fifth, 433(17.4%) reported having heard of oral contraceptives. Only 68 answered further knowledge questions on OCP of which about a third (33.8%) of the women had above average knowledge. The mean knowledge scores about contraceptives in general, oral contraceptives and about emergency contraception were uniformly low at 0.8 (maximum 2.5), 2.2 (maximum 3.5) and 0.2 (maximum 1.5). Only 206 (8.3%) had heard of emergency contraception and the knowledge regarding emergency contraception was above average among only a fifth, 21.5% (247/1146).

More than a fourth 658 (26.4%) (95% CI 27.9,24.9) of the women reported current use of contraceptive. This was validated by a second study among a subset of 298 reproductive age women where the prevalence of contraceptive use was found to be almost the same at 29%.

Among those who used contraceptives, a majority 420/658 (63.8%) had used permanent methods and a similar percentage of women had used hormonal contraceptive 57/658 (8.7%) and condoms 46/658(7%). Intrauterine contraceptive device such as Copper T(CuT) was reported to have been used by 107/658 (16.3 %) and 14/658 (2.1%) reported using other methods including traditional methods. Nobody reported the use of an injectable hormonal contraceptive. Most of them relied on the Government health system for their contraceptive needs and obtained it from the primary health centres, Accredited Social Health Activists (ASHA), District hospital and a few from medical shops. The most recent use of contraceptives was reportedly for family planning more than half of the time 58.6% (237/404), 7.1% (29/404) for religious reasons and 4.9% (20/404) used it at the partner's insistence. Despite the current use of contraceptive being only 26%, less than 1% (23/2495) women reported accidental pregnancy. About 39 women (1.6%) reported that they had used emergency contraception.

Among those who reported not to have used a contraceptive, worry about the side effects (13.5%) and partner not wanting to use a method (11.8%) were the main reasons. About 4.8% also mentioned that they did not know how to use the contraceptive method and 7.2% did not need to use a contraceptive method as they were below 18. About a fourth, 26.4% mentioned a variety of reasons for not using such as husband's illness, have decided not to use, have not felt its need, wanted pregnancy, divorced, self-control, need one more child, recently married and not pregnant, natural methods, planning to conceive and planning to do tubectomy, staying away from husband, , widow etc.

Regarding oral contraceptives which was a particular focus of this study, about 61.5% had never used oral contraceptives. Most of the users of oral contraceptives 27/58 had only used it sometimes. About a half 28/58(48.2%) used OCP for attending religious rituals for not more than a week and (41.3%)24/58 for

contraceptive use. The most reported side effects were irregularity in menstrual cycle (24.64%) and vomiting (15.94%). Overuse or continuous use of contraceptive for non-contraceptive use was not found, although present in other neighbouring tribal communities[15,16] and this was also corroborated by the tribal officers of the area.

Determinants of knowledge of contraceptive use

After multivariate logistic regression, the educated were found to have a 2.2 times greater likelihood of above average knowledge (95% CI 1.2,3.9) about contraceptives. Compared to other indigenous groups Paniya's had 67% poorer knowledge (aOR .33 95% CI 0.17,0.65). Though the current use of contraceptives was 1.2 times more likely with above average knowledge, this was not significant. Knowledge of emergency contraception was an important determinant of general knowledge of contraceptives (aOR 6.9,95% CI 3.86,12.36; p<.001).
Though a clustering of risk factors for below average knowledge of contraceptives such as tobacco, alcohol use and illiterate was observed (Table 2a) only education was found to be an independent variable for above average knowledge (aOR 2.2;95% CI 1.2,3.9). Those who desired more than two children irrespective of whether they were boys or girls had significantly lower knowledge (aOR .59;95% CI .38,.94; p<.025) (Table 2b). Others such as age >31years, employed, married women, more than three children having significant association with knowledge disappeared with regression analysis (Table 2a,2b). More than half of the women198(55.6%) in the reproductive age group with above average knowledge said that another child is not required if existing two children belong to the same sex compared to 360(44.8%) in those who said yes(p<.001) indicating no bias for male children.

Determinants of contraceptive use

A multivariate logistic regression of the determinants of current use of contraceptive showed that age at menarche >13 years (aOR 1.69, 95% CI 1.14,2.52; p<0.009) and belonging to Paniya tribe had significantly higher use of contraceptive (aOR 2.67, 95% CI 1.49,4.77;p<.001). Though Kattunaickens, a PVTG had lower contraceptive use this was not significant (Table 3a). Those who stayed in a kutcha house were also less likely to have used a contraceptive (aOR 0.55, 95% CI .31,.95;p<.035)(Table 3b). Though the employed had a higher use of contraceptive in univariate analysis after regression the contraceptive use was significantly lesser among the employed. The final multivariate regression model also included variables such as more than three children, marital status, poorer knowledge scores though significantly associated in the univariate analysis disappeared in the regression analysis done by the enter method (Table 3a,3b). Among the different tribes Kattunaickens , a Particularly vulnerable tribal group had the lowest use of contraceptive at 23.8%, followed by other groups at 26.5% and 39.9% among Paniyas.

A larger proportion of women (42.5%) preferred two children per family, closely followed by (38.2%) women desiring 3 children. The spacing between children suggested was three years by 31.2% and 4 years by 17.8%. There did not appear to be a gender bias in favour of the male child as only 98(3.9%) of women reported that another child was necessary if both the children were girls. Similarly, only about 102(4.1%) reported that another child was necessary if the children were both boys.

Discussion

The current use of contraceptives was reported by 26.4% of indigenous women in the reproductive age group. Knowledge of contraceptives underpins use. The above average knowledge scores were found to be higher among the educated and also aligned with the above average knowledge of emergency contraceptives. Knowledge was lower among those who desired more than two children and among one of the backward tribes, the Paniyas . Contraceptive use was higher among the those belonging to the Paniya tribe and among those with an age of menarche more than 13 years and lesser among those with a kutcha house.

Among the 26.4% contraceptive users, 63.9% used permanent methods, 9% used hormonal contraceptive,7% used condoms, 16.3 % used CuT and 2.1 % used other methods including traditional methods. This is much less than that the state average of 53 percent.[17] The contraceptive use varies in other states among the tribals with higher use reported in Assam (36%)[18] and Bengal 40%.[19] In the state of Maharashtra it varied from 18.7%[20] to a spacing contraceptive use of 27.7% (10.8% pill, 13.3% condom, 2.0% IUD, 1.6% withdrawal or rhythm).[21] This also underlines the heterogenous character of the tribal groups across the country varying in population size, language and their interaction with the rest of society[22] and thus having different contraceptive use rates. In neighbouring Bangladesh the contraceptive use among tribals was very high at 73% which was also

much higher than among the general population of that country. [23] The primary reason for low contraceptive use may be the low access to contraceptive knowledge and services as observed in Maharashtra and Tamil Nadu.[21] [24] Other reasons could be early marriage, childbearing observed among tribal groups in Madhya Pradesh and Rajasthan [25] which was in turn associated with low contraceptive use [11] and lower education.[24] Other studies in central India, Nepal substantiated the role of women and husbands' education, age of women, and number of surviving boys in the use of any modern method of contraception.[5] [26] Nevertheless, the different ethnographic backgrounds of the various tribal groups across different parts of India result in a non -uniform pattern of use of contraceptives. The independent determinants of contraceptive use in this study were belonging to the Paniya group and a lower use among those staying in a kutcha house. Though, India as a whole has maintained a steady decline in fertility,[27] studies among tribal communities' report some of the lowest rates of contraceptive use and an increasing fertility rate.[27] With the exception of the scheduled tribes who have a total fertility rate (TFR) of 2.3, the TFR of all population groups in Kerala are below replacement level at 1.6.[17] This also corresponds to the mean number of children in this study at 2.34±1.18. The total fertility rate in central Indian state of Madhya Pradesh among the indigenous tribes was 2.7. [28] Though, the fertility levels in this study are higher than the general population it is not as high as the other tribal communities indicating the use of perhaps other traditional methods such as withdrawal method, calendar method etc which may not have been revealed fully in this cross-sectional study or the influence of the general population. Traditional method use such as rhythm, withdrawal is the highest in the state in this district at 5.6%. [17] Other reasons could be the high prevalence of reproductive tract infections . The few studies among tribal women on reproductive infection in a southern and northern state of Karnataka and Himachal Pradesh found a prevalence of 12-14%.[29] [30]

Reduced contraceptive use may also be due to the difficult access to health care services. The tribal people rely on the public health system which is in general characterised by low output, low quality and low outcome delivery system. [31] An ethnographic study in an adjoining district showed that the hesitancy to access services in spite of being provided free services and a comprehensive financial protection package was due to the failure to provide culturally respectful care and the lack of power on the part of the indigenous community to negotiate with the health system.[32] In India, across 10 states with sizable tribal population, the percentage surplus/deficit of healthcare providers in tribal areas is found to -33% Allopathic doctors at Primary Health Centre(PHC), and -84% specialists at Community Health Centre(CHC) which is indicative of the huge deficiency of specialist doctors and thus quality healthcare in the existing primary healthcare system.[31]

Knowledge of contraception is almost universal in Kerala. Among all women, 44 percent knew about emergency contraception.[17] However, in the current study, only 36.7% had above average knowledge of contraceptives. This is similar to other studies also with Prusty et al. reporting considerably lower knowledge among tribal women compared to their non-tribal counterparts in the three central Indian states.[5] However, tribal women in the north eastern part of India had good knowledge of contraceptives and correspondingly the contraceptive use was also high.[18] The awareness levels of contraception in general, was closely aligned with the awareness of emergency contraceptives (aOR 6.9,95% CI 3.86,12.3) and educational levels (aOR:2.2, 95% CI 1.2,3.9). Findings suggest that lower spacing contraceptive use among tribals is driven by social vulnerabilities such as low education, housing and higher fertility preferences.[21]

Gender norms related to fertility is an important issue determining contraceptive use in the tribal community.[24] Gender relations among Indian tribes have historically been more balanced and equitable; however there is an increasing trend of gender bias in tribal culture emerging due to the assimilation and modernising process.[33] [34] The tribes in Kerala seem to be more equitable with a male child preference not indicated with the desire for a third child expressed when the initial two children are of the same sex. In the north-eastern state of Meghalaya 86% of the population is tribal and followed a matrilineal system. It had the lowest contraceptive use of 20.2% with a corresponding high total fertility rate of 4.57.[35] [36] Though, tribal women have more independence and fewer restrictions than women belonging to caste Hindu communities, in some states such as Odisha, their status remained low and decision-making regarding issues like seeking health care and large expenditures rested with men.[37] Even in neighbouring Bangladesh, no preference of son over daughter was observed among tribal communities,[23] whereas women in Kerala are slightly more likely to use contraception if they already have a son.[17]

Though the Paniya group had lower knowledge scores compared to the other groups, contraceptive use was higher compared to other tribal groups. This may be due to the fact that the Paniyas, a marginalised group among the tribals use more of the public health services [38] and the subcentres which provide family planning services do not incur an additional travel cost. This is a cross-sectional study and temporal relationships between knowledge and use cannot be studied. Spatial (or geographical) isolation is cited as the major reason for the

exclusion and backwardness of indigenous com- munities in both China and India.[6] The living conditions, an underprivileged background, and social vulnerability may contribute to low contraceptive use.

A limitation of the study is that the contraceptive use was self-reported, which inherently carries the risk of underreporting as the persons of tribal origin are known to be shy and reclusive. However, trained local personnel were employed, who were able to reduce underreporting. In addition, the prevalence of contraceptive use has been corroborated by a repeat study using a smaller sample. Though, the findings are generalisable to the persons of tribal origin as a whole, the various tribal /indigenous groups have not been covered equally due to difficult terrain and the possibility of human-wildlife conflict. Other ethnographic studies among the various tribal communities are necessary to understand the use of traditional methods of contraception. Data related to some variables are missing though it is negligible, ranging from 3% to 10% .

Thus, at a policy level more changes are necessary. In spite of the numerous schemes and support such as Tribal Health promoter, Oorumithram (friend of the village) there is a huge gap in understanding the tribal persons belonging to different groups. A more culturally sensitive and respectful approach is necessary. Universal access to family planning services, aligned with SDG goal 3.7, data suggests that we are far from achieving this goal when it comes to tribal communities.

Conclusion

Awareness and use of contraceptives are poor though the fertility is not commensurately high. Along with developing targeted responses to contraceptive use among indigenous people with indigenous data[3], awareness also requires attention. This study shows a higher use of contraceptive among Paniyas and ethnographic studies are necessary to determine the differences in contraceptive use including traditional methods among the various indigenous groups.

Author Contribution

Aswathy S: Concept, design, data collection, analysis and interpretation, writing up
VijayaKumar K: Design, data collection guidance, analysis and interpretation, editing
Shana Shirin Najeeb: Data collection, drafting the work, analysis
Vishnu B Menon: Data acquisition, analysis, and interpretation of data for the work, Drafting the write up
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Fig 1: Selection of sample and sample size

Fig 2: Map of the area

Fig 3: Conceptual framework for the development of questionnaire

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Table1: Sociodemographic distribution of the study population

Variables	Frequency	Percentage
Type of house		
Kutcha	491	20.4
Pucca	1690	70.4
Others	220	9.2
*94 missing		
Tribe		
Paniya	1478	59.2
Kurichiyar	339	13.6
Adiya	273	10.9
Others	405	29.8
Age (in years)		
≤31	1303	54
>31	1111	46
*81 missing		
Education		
Illiterate	395	17.2
Literate	1898	82.8
*202 missing		
Occupation		
Employed	1419	69.6
Unemployed	620	30.4
*456 missing		

Marital status		
Currently married	1695	70
Others	725	30
*75 missing		
No: of children		
≤3	1232	85.4
>3	211	14.6
Tobacco use		
Yes	1436	57..6
No	1059	42.4
Alcohol use		
Yes	92	3.7
No	2403	96.3
Regular periods		
Yes	2075	83.2
No	420	16.8
Currently pregnant		
Yes	83	3.3
No	2412	96.7
Age at menarche (in years)		
≤13	1428	61.7
>13	886	38.3
*181missing		
Ideal family size		
<=2	1109	47.6
>2	1222	52.4
*164 missing		
Desire for a third child if the first two children are of the same sex		
Yes	1519	68.4
No	703	31.6

*273 missing		
Knowledge - General		
Below Average	666	53
Above Average	590	47
Knowledge - OCP		
Below Average	28	41.2
Above Average	40	58.8
Knowledge - Emergency Contraception		
Below Average	899	78.4
Above Average	247	21.6
Ever use of contraceptive		
Yes	658	26.4
No	**1837**	**73.6**
Type of contraceptive used		
Permanent	**420**	**63.8**
Hormonal (OCP)	**57**	**8.7**
Condoms	**46**	**7**
CuT	**107**	**16.3**
Others including traditional methods	**14**	**2.1**

Table 2a. Determinants of knowledge of contraceptives: Univariate Analysis

		Knowledge levels Above Average (%)	Total	p value
Age	≤31yrs	279(44.9%)	622	.121
	>31yrs	294(49.3%)	596	
Education	Illiterate	53(36.1%)	147	.001
	Literate	501(51%)	983	

Occupation				
	Employed	319(45.8%)	26	.015
	Unemployed	188(53.9%)	349	
Tribe	Paniya	66(34.7%)	190	.000
	Kattunaicken	254(41.6%)	610	
	Others	270(59.2%)	456	
Type of house				
	Kutcha	113(42%)	269	.094
	Pucca	413(49.5%)	835	
	Others	50(50%)	100	
Marital status	Currently married	484(51.3%)	943	.000
	Others	94(33.6%)	280	
No of children	≤3	368(53.6%)	687	.04
	>3	49(43%)	114	
Current use of contraceptive				
	No	457(49.7%)	919	.001
	Yes	133(39.5%)	337	
Tobacco use	Yes	269(40.1%)	670	.000
	No	321(54.8%)	586	
Alcohol use	Yes	9(18.8%)	48	.002
	No	581(48.1%)	1208	
Knowledge regarding emergency contraceptives				
	Below Average	323(37.6%)	859	.00
	Above Average	185(77.7%)	238	
Knowledge regarding oral contraceptives				
	Below Average	12(42.9%)	28	.61
	Above Average	17(50%)	34	
Attitude				
	Below Average	127(28%)	520	.00
	Above Average	463(57.7%)	736	

Table 2b: Independent determinants of above average knowledge of contraceptives

	cOR	95% CI	p	aOR	95% CI	p
Education						
Literate	1.84	1.28,2.64	.001	2.22	1.23,3.98	.011
Illiterate	1			1		
Tribe						
Paniya	.36	.26, .52	0.001.	0.33	0.17, 0.65	.001
Kattunaicken	.49.	.38, .62	0 .01	0.7	0.41, 1.17	.17
Others	1			1		
Occupation						
Employed.	0.72	.55,.93	0.014.	1.00	.65,1.55	.98
Unemployed	1			1		
Attitude						
Good	3.49.	2.72,4.48		4.88	3.11,7.65	.001
Poor	1					
Marital status						
Ever married.	2.08	1.57,2.75	0.01	.65	.32,1.32	.242
Others	1			1		
Tobacco Use						
Yes	.55.	.44,.69	0.01	.67	.41,1.08	.104
No	1			1		
Alcohol use						
Yes	.25.	.12,.52	0.01	.56.	.11,3.05	.507
No	1			1		
Ever use of contraceptive						
Yes	.66	.51,.85	0.01.	1.24	.75,2.06	.40
No	1			1		
Knowledge regarding emergency contraceptive						
Above Average	5.79	4.14,8.09	.001	6.9	3.86,12.36	.001
Below Average	1			1		
No of children						
>3	.65	.44,.97	.037	1.07	.58,1.96	.815
≤3	1			1		
Fertility intention						
Yes	.65.	.50,.83	.001	.59	.38,.94	.025
No	1			1		

Table 3a: Factors affecting current contraceptive use

		Current contraceptive use Yes	Total	p
Age	≤31yrs	343(26.3%)	1303	.88
	>31yrs	289(26%)	1111	
Education	Illiterate	84(21.3%)	395	.06
	Others	488(25.7%)	1898	
Tobacco use	Yes	382(26.6%)	1436	.78
	No	276(26.1%)	1059	
Occupation	Employed	378(26.6%)	1419	.017
	Unemployed	134(21.6%)	620	
Alcohol use	Yes	24(26.1)	92	1
	No	634(26.4)	2403	
Age at menarche				
	≤13 yrs	344(24.1)	1428	.001
	>13	270(30.5)	886	
Regular periods	Yes	540(26)	2075	.395
	No	11(28.1)	420	
Knowledge general				
Below Average		204(30.6%)	666	.001
Above Average		133(22.5%)	590	
Knowledge of OCP				
Below Average		9(32.1%)	28	.58
Above Average		10(25%)	40	
Knowledge of emergency contraceptive				
Below Average		256(28.5%)	899	.023
Above Average		52(21.1%)	247	
Attitude				
	Poor	422(29.3%)	1440	.000
	Good	236(22.4%)	1055	

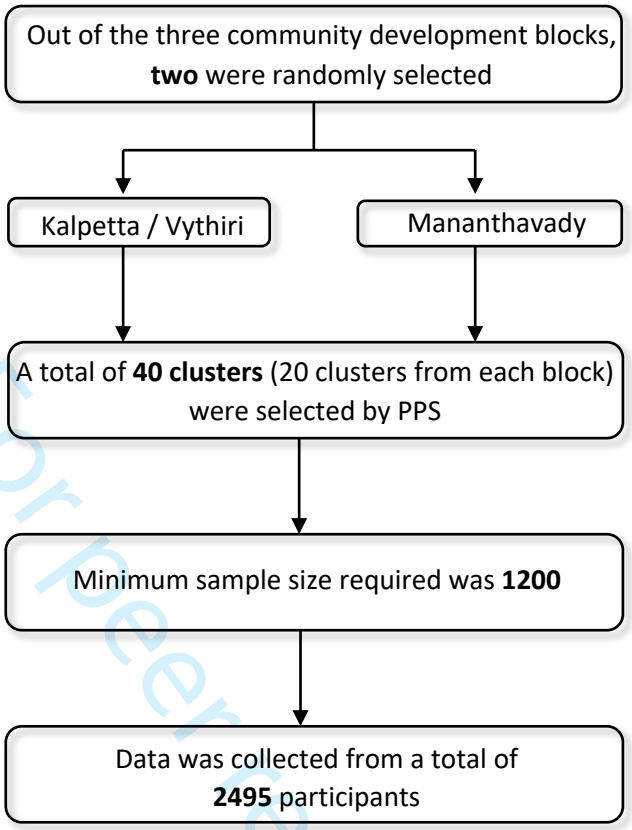
Tribe	Paniya	109(39.9%)	273	.000
	Kattuunaicken	352(23.8%)	1478	
	Others	197(26.5%)	744	
Type of house				
	Kutcha	104(21.2%)	491	.004
	Others	554(27.6)	2004	
Marital status				
	Currently married	415(24.5%)	1695	.013
	Others	213(29.4%)	725	
No of children				
	≤3	295(23.9)	1232	.008
	>3	69(32.7)	211	

Table 3b: Independent determinants of current contraceptive use

	Current contraceptive use			
	COR	95% CI p	AOR	95% CI p
Age at menarche (years)				
≤13	1		1	
>13	1.38	1.145,1.666 .001	1.69	1.14,2.52 0.009
Tribe				
Others	1		1	
Paniya	1.85	1.38,2.47 <.001	2.46	1.54,3.94 <.001
Kattunaicken	0.87	0.71,1.06 .17	0.98	0.67,1.43 .24
Occupation				
Employed	1.32.	1.05,1.65 0.016	0.59	0.38,0.9 .015
Unemployed	1		1	

Type of house				
Others	1			
Kutcha	.70	.55,.89 .004	.55	.315,.959 .035
Marital status				
Evermarried	0.77	.64,.94 .012	.85.	.422,1.71 .65
Others	1		1	
No of children				
>3	1.54.	1.12,2.11 .007	1.22.	.69,2.16 .48
≤3.	1		1	
Knowledge - General				
Above average	0.65	.51,.85 .001.	.93	.58,1.47 .75
Below average	1.		1	
Knowledge - Emergency Contraceptive				
Above average	0.67	.47,.94.	.86	.50,1.49
Below average.	1	.02	1	0.614

Fig 1. Selection of sample and sample size



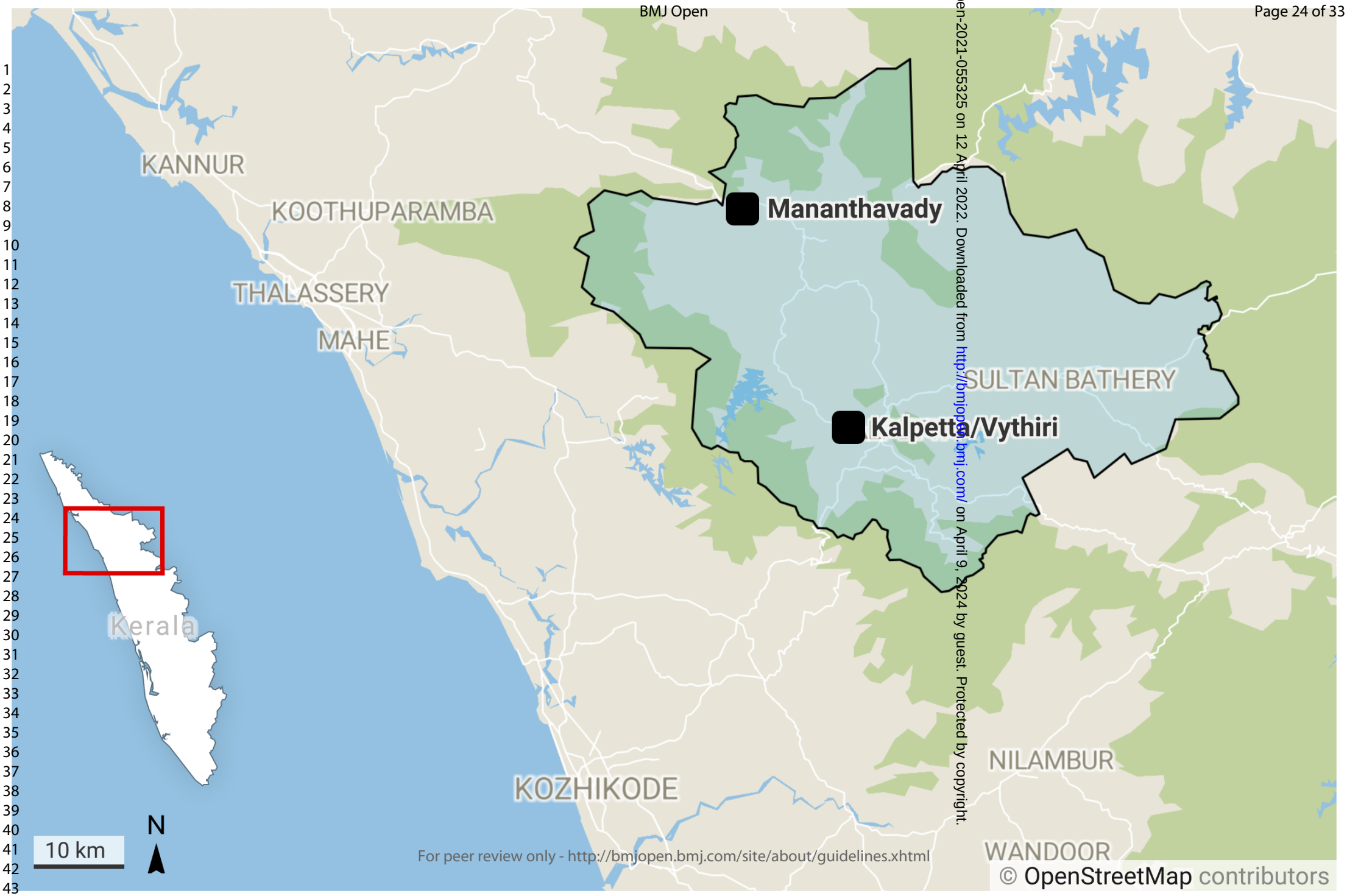
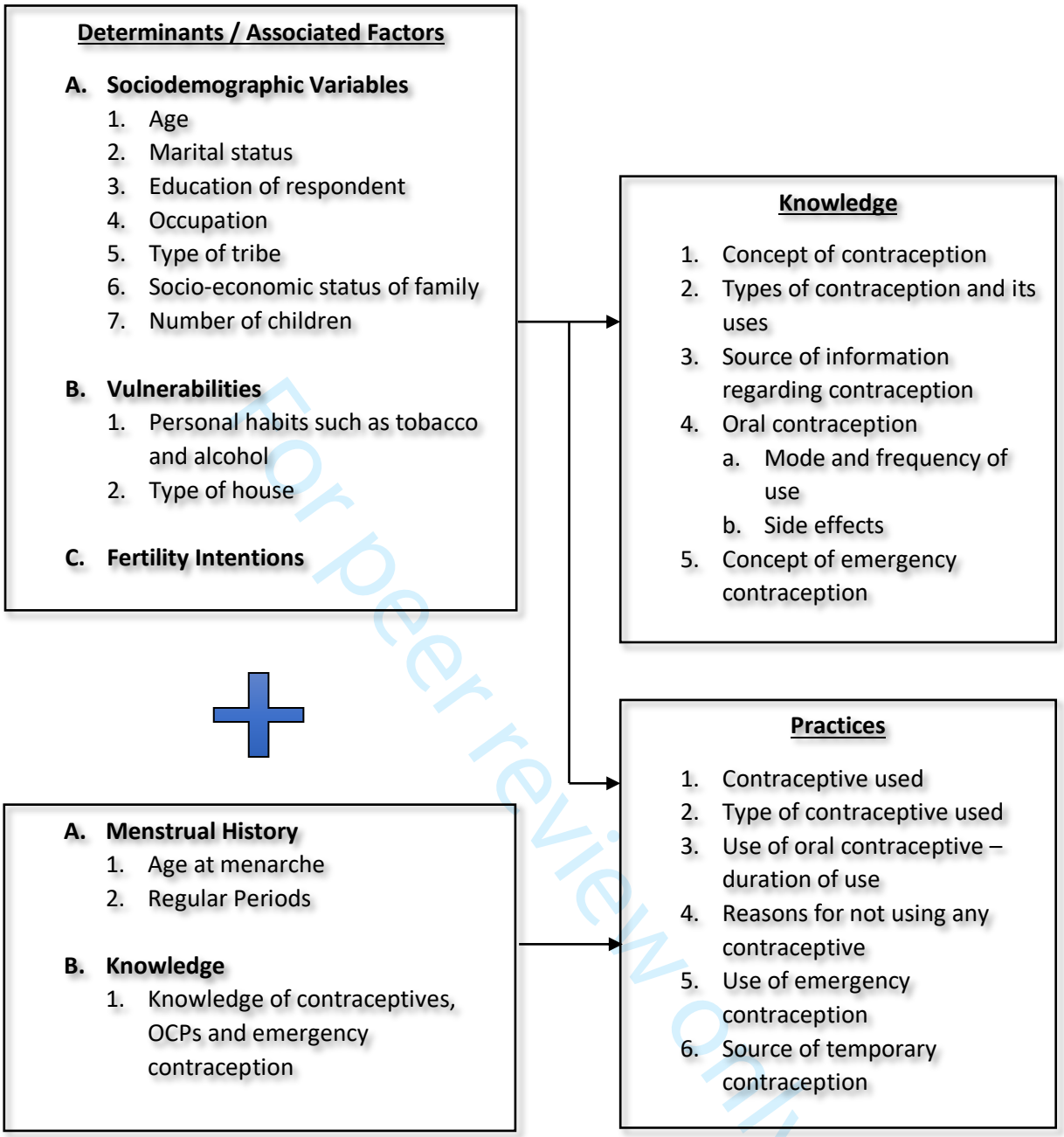


Fig 3. Conceptual framework for the development of Questionnaire



Supplement – 1
Sample size calculation

According to a study conducted in Wayanad the contraceptive use among tribals of Wayanad was 40.7%.[9] With 95% confidence interval and 10% relative precision using the formula (Z1-alpha/2) pq/d2 the sample size was calculated to be 583. With a design effect of 2 a final sample size of 1166 was obtained rounded to 1200 for each block.

Pattern of contraceptive use, determinants and fertility intentions among tribal women in Kerala, India: A cross sectional study

1. Sl no:
2. Phone no:
3. Ward:
4. Panchayat
5. CD block
6. Age:
7. What is your highest level of education (woman in the reproductive age group)
   a) Literate b) Illiterate c) Primary d) Graduate/Post Graduate

8. What is your occupation a) Coolie b) Traditional work c) Housewife d) Professional e) Others-specify
9. Income

Sl no	Family members	Income	
Total no of members		Family income	Percapita income

10. Type of house a) Kucha b) Pucca c) Others (specify)

11. Tribal group: a) Adiya b) Paniya c) Kattunaikkan d) Kurichiyan e) Oorali kuruma

f) Others (Specify)

Personal Information

12. Marital status a) Married b) Divorce c) Widow d) Not married e) Separated

f) Unmarried mother

13. In the last one month have you used any tobacco product such as Beedi/ Cigarette / Chewing tobacco) ? a) Yes b) No

14. Have you used alcohol in the past one month? a) Yes b) No

Menstrual History

15. Age of attainment of menarche

16. a) Is your menstrual cycles regular? a) Yes b) No

    b) How frequently does your menstruation cycles occur? ----------days

17. How many days your cycle last? ----------days

18. Do you have dysmenorrhea? a) Yes b) No

19. Do you have intermenstrual bleeding/spotting? a) Yes b) No

20. Ask married woman above 18 yrs: After sexual contact do you have bleeding/spotting?

a) Yes b) No c) Not Applicable(for unmarried woman below 18 yrs)

21. Last menstrual period----------(day/month/year)

Obstetric history (Ask to those who were pregnant for at least one time)

22. Are you pregnant now? a) Yes b) No

23. If yes how many times have you been pregnant? (Including current pregnancy)

24. How many newborns (who have completed 7 months/28 weeks of gestation have you given birth to ?

25. How many children do you have?

26. a) History of abortions? a) Yes b) No

b) If yes how many?

27. What type of abortion was the last one ?

a) Modern medical technique b) Traditional c) Natural d) Others (specify)

Knowledge of contraceptives

28. Have you heard about contraceptives a) Yes b) No

29. If yes, what was your source of information about contraception?

(Multiple responses)

a) Friends/Relatives b) Media/Print c) Health workers d) Doctors

e) Others (specify)

30. What does the term contraceptive methods mean ?

31. Which all contraceptive methods are you aware of ? (If there is no response ,pl probe) (Multiple responses)

a) Hormonal pills/ Injectables b) IUD c) Condom (Nirodh) d) Others (specify)

32. Have you heard about oral contraceptive pills? a) Yes b) No (If no go to Q 37)

33. How should the tablets that are a part of the oral contraceptive pills be taken? (How many days after periods)

a) 1st day b) 5th day c) 10th day d) Don't know

34. How frequently should oral contraceptive pills be taken?

a) Daily b) Alternate days c) Weekly once d) Monthly once e) Don't know f) Others specify

35. How many tablets are there in a pack of oral contraceptive pills?

36. What are the side effects of oral contraceptive pills?

a) Infertility b) Irregular periods c) Obesity d) Vomiting e) No side effects f) Don't know g) Others specify

37. Have you heard about emergency contraception? a) Yes b) No

38. What do you understand by the term emergency contraception?

39. Can emergency contraception be a substitute for regular contraception methods? a) Yes b) No c) Don't know

40. Do you think contraceptive methods are completely effective in preventing pregnancy? a) Yes b) No c) Don't know

Attitude

Please mark against each statement the attitude which corresponds to the viewpoint of f the respondent

		Strongly agree	Agree	Don't know	Disagree	Strongly disagree
41	Females should take an active role in the use of contraceptive methods					
42	Females and males have equal role in taking decisions on use of contraceptives					
43	Opinion regarding sexual intercourse without female partners consent					
44	Opinion regarding Sexual contact among adolescents before 18 years of age					
45	Opinion regarding pre-marital sex					
46	Use of contraception by unmarried woman is against woman's morality					
47	Emergency contraception can be used routinely like other contraceptive methods					
48	Contraceptive pills can be used for longer duration (>3 months) to prevent pregnancy					
49	Contraceptive pills can be used for more than 3 months for treatment of menstrual disorders					
50	Contraceptive pills can be used for long duration (>3 months) for delaying menstrual cycle					
51	Contraceptive pills can be used for prolonged periods so that you don't have to follow the practice of staying in "Valaymapura"					

Practices

52. Have you ever used any contraceptive methods?

a) Yes b) No If no go to Q 59

53. Are you currently (within the past one month) using a contraceptive method?

a) Yes b) No

54. Which of the following contraceptive measures are you using?

a) Condom b) Oral pills c) Cu T d) Permanent sterilization e) Others specify

55. Condom----------how many months of use

Oral pills----------how many months of use

CuT----------how many months of use (one that you used last)

56. If you have used any temporary method of contraception, from where did you get it?

57. Why did you choose the contraceptive method which you have used recently?

a) To avoid unwanted pregnancy b) To attend religious function c) By partners compulsion d)Don't know e) Not applicable

58. Did you have any unplanned pregnancy? a) Yes b) No c) Don't know

59. Have you used any emergency contraceptive methods? a) Yes b) No c) Don't know

60. Reasons for not using any contraceptive methods?

a) Infrequent sexual contacts wouldn't result in pregnancy

b) Contraceptive methods are expensive

c) Worried about side effects

d) Partners disinterest in contraceptive method usage

e) Discomfort in buying contraceptive methods

f) Use of contraceptive methods results in decrease in pleasure during contact

g) Don't know how to use contraceptives

h) No sexual contacts

i) Others (specify)

61. How often have you used oral pills?

a) Always b) Many times c) Rarely d) Once in a while e) Not used

62. If answer is a) what is the reason for continuous use of oral contraceptive pills regularly?

a) To avoid unwanted pregnancy b) b) To attend religious function c) By partners

compulsion d) Don't know e) To avoid going to Valaymapura (Menstrual hut)

63. Have you experienced any side effects after using oral pills? a) Yes b) No

64. If yes, which of the following

a) Infertility b) Irregular periods c) Increase in body weight d) Vomiting e) No side effects f) Others (specify)

65. According to you how many children should be there in a family?

66. What should be the required age gap between 2 children?

67. Does a family with 2 male child/female child require one more child?

a) Only for family with 2 girl child b) Only for family with 2 male child c) in both cases d) not required for a and b

Filled by - Name:

Sign:

Verified by:

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	5,6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5,6,7
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6
		(*b*) Describe any methods used to examine subgroups and interactions	
		(*c*) Explain how missing data were addressed	6
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	6
		(*e*) Describe any sensitivity analyses	
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	6
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	22
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7
		(b) Indicate number of participants with missing data for each variable of interest	14
Outcome data	15*	Report numbers of outcome events or summary measures	7,8
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	17,18
		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	-
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	-
Discussion			
Key results	18	Summarise key results with reference to study objectives	8,9,10
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	10
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	8,9,10
Generalisability	21	Discuss the generalisability (external validity) of the study results	10
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	2

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.