

Title Page

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

Title

Competency assessment of the medical interns and nurses and prevailing practices to provide family planning services in teaching hospitals in three states of India.

Author names and affiliations

Madhu Gupta^{1*}, Madhur Verma^{1,#a}, Kiranjit Kaur¹, Kirti Iyengar², Tarundeep Singh¹, Anju Singh³

¹ Department of Community Medicine and School of Public Health, Postgraduate Institute of Medical Education and Research, Chandigarh, India.

² United Nations Population Fund, New Delhi, India.

³ Department of Obstetrics and Gynaecology, Postgraduate Institute of Medical Education and Research, Chandigarh, 160012. India.

^{#a} Department of Community Medicine, Kalpana Chawla Government Medical College, Karnal, Haryana, India.

* Corresponding Author

Dr. Madhu Gupta, MD, PhD

Email: madhugupta21@gmail.com (MG)

22 **Declaration of Interest**

23 None

24 **Word Count**

25 Abstract: 250

26 Implications:50

27 Manuscript text: 2650

28 References: 34

29 Tables: 7

30 Supplementary tables: 2

31

32 **Abstract**

33 **Objectives:** The objectives of the study was to assess the knowledge and skills of medical interns
34 and nurses regarding family planning (FP) services, and document the prevailing FP practices in
35 the teaching hospitals in India.

36 **Study Design:** A cross-sectional study was conducted in three states (Delhi, Rajasthan, and
37 Maharashtra) of India, among randomly selected 163 participants, including medical interns
38 (n=81) and in-service nurses (n=82), during 2017. Semi-structured, pre-tested interview schedule,
39 was used to assess the knowledge and status of training received; and objective structured clinical
40 examination (OSCE) based checklist was used to assess the skills.

41 **Results:** About 60% of the interns and 48% of the nurses knew more than five contraceptives that
42 could be offered to the clients. About 22% (11.1% interns and 33.3% nurses) respondents believed
43 that contraceptives should not be given to a married woman coming alone, and 31.9% (17.3%
44 interns and 46.3% nurses) respondents reported that it was illegal to provide contraceptives to
45 unmarried people. Nearly 43.3% interns and 69.5% nurses refused to demonstrate intrauterine
46 contraceptive device (IUCD) insertion in the dummy uterus as per OSCE, and among those who
47 did, 12.3% interns and 18.3% nurses had failed. About 63% interns and 63.4% of nurses had
48 observed IUCD insertion, and 12.3% interns and 17.1% had performed IUCD insertion, during
49 their training.

50 **Conclusions.** Knowledge and skills of interns and nurses regarding FP services were only partial.
51 The medical training during graduation or internship, and during the job, was found to be
52 inadequate to provide quality FP services.

53 **Keywords:** contraception, competency, family planning, medical interns, nurses

54

55 **Implications**

56 The partial knowledge and skills of medical interns and nurses regarding family planning
57 services indicated inadequate training received, and substandard quality of services rendered
58 by them, which may put the universal access to sexual and reproductive health care services
59 and rights in the developing countries at risk.

60 61 **Main Text**

62 63 **1. Introduction**

64 A comprehensive sexual and reproductive health deals with issues concerning the reproductive
65 system, including sexual health and not only birth control [i]. It is essential for ensuring universal
66 access to sexual and reproductive health care services and rights, to reduce maternal mortality ratio
67 to less than 70 per 100,000 live births and to end preventable deaths of new-borns and under-five
68 children and for the achievement of Sustainable Development Goal three by 2030 [ii]. Despite the
69 fact that India was the first country to launch family planning program in the year 1952, it continues
70 to be the second most populous country in the world[iii]. In the last decade, there were minimal
71 improvements in the family planning (FP) indicators. Data from the national level surveys suggest
72 that the birth rate has declined from 23.8/1000 mid-year population in 2005 to 20.4/1000 mid-year
73 population in 2016, total fertility rate from 2.7 to 2.2, contraception use rate has increased from
74 56.3% to 57.2%, and unmet need of FP decreased from 13.9 to 12.9 [iv,v]. There is evidence that
75 the cafeteria or basket of choices approach of providing FP services, is not being implemented
76 effectively [vi,vii].

77

78 To deliver effective FP services there is an urgent need to develop trained human resource that
79 includes doctors and nurses. As per the Medical Council of India, it is necessary for the medical
80 graduates to undergo a compulsory one-year rotatory internship after the final year to acquire the
81 essential skills. Similarly, Indian Nursing Council ensures uniform standards of training for nurses
82 including general midwifery and nursing (GNM), auxiliary midwifery and nursing (ANM) and
83 Bachelor of Science in Nursing (BSc). However, it has been observed that teaching practices in
84 medical and nursing colleges in India are often not evidence-based, and may not align with ever
85 evolving standard protocols and the national guidelines, especially with respect to FP services
86 [viii,ix]. With this background, this study was conducted with the objectives to assess the knowledge
87 and skills of medical interns and nurses regarding FP services; and to document the prevailing FP
88 practices in the teaching medical facilities in India, so that medical education could be strengthened
89 and family planning services were improved.

90

91 **2. Methodology**

92 A cross-sectional study was conducted in three purposively selected states including Delhi,
93 Rajasthan, and Maharashtra, India, between November and December 2017. The study participants
94 were medical interns who had passed final exam of bachelor of medicine and surgery (MBBS),
95 and completed compulsory rotatory training in the department of obstetrics and gynecology;
96 nurses, who were already in the job, with less than 5 years' of experience in the medical college or
97 health posts attached with the medical colleges; and faculty or medical officer-in-charge of FP
98 centre in the department of obstetrics and gynaecology or community medicine.

99

100 Assuming knowledge percentage score of medical interns and nurses regarding FP services as
101 50%, absolute precision as 10% and a design effect of 1.5, the sample size was calculated to be
102 145 using OpenEpi, version 3, open source calculator [x]. Assuming a 10% non-response rate, the
103 final sample size is estimated to be 160 (80 interns and 80 nurses). Multistage simple random
104 sampling technique was used to first select two districts within each study states, and then two
105 medical colleges from the selected districts in the second stage. Private medical colleges were
106 excluded, as it was difficult to get permission from these colleges. Since, Delhi did not have
107 districts, hence, two medical colleges were selected randomly within it. However, the approval to
108 conduct the study in one of the medical colleges could not be obtained, hence, the additional
109 medical college from Maharashtra was selected. Hence, a total of six medical colleges (one
110 medical college in Delhi, two in Rajasthan and three in Maharashtra) were included in the study.
111 Interns and nurses who had fulfilled the inclusion criteria were enlisted and proportionate number
112 (19, 31 and 31 interns from Delhi, Rajasthan and Maharashtra) were randomly selected.
113 Permission to interview nurses could not be obtained from the selected medical college in Delhi.
114 Hence, 32 nurses from Rajasthan and 50 from Maharashtra were randomly selected. After ensuring
115 anonymity, written informed consent was obtained from the participants prior to the start of the
116 interview.

117
118 A semi-structured, pre-tested interview schedule was developed in consultation with family
119 planning experts from UNFPA, experts from the department of obstetrics and gynecology,
120 community medicine and public health, to collect data by face to face interview. The content
121 validity was further established by the another group of experts from the same departments.
122 Translation of the tool was done in Hindi to interview nurses. To assess the skills of the interns

123 and nurses an observation checklist based upon Objective Structured Clinical Examination
124 (OSCE) was developed, for demonstration of steps of the intrauterine contraceptive device (e.g.,
125 CuT) insertion in a model, condom use on the thumb and use of Medical Eligibility Criteria (MEC)
126 Wheel. A tool to assess the prevailing FP practices in the department of obstetrics and gynecology
127 or community medicine was also prepared. Two postgraduate doctors (Doctor of Medicine in
128 Community Medicine and Masters in Public Health) were specially recruited, and trained by the
129 experts (faculty) from obstetrics and gynecology, and community medicine department to collect
130 the data after obtaining written consent. Their work was regularly supervised by these experts in
131 the study states to ensure data quality. Data was entered and analyzed in Statistical Package for
132 Social Sciences, version 16.0.

133 *2.1 Ethical Considerations*

134 Institute's Ethics Committee of the main coordinating institute and study medical colleges had
135 approved the study.

136

137 **Results**

138 A total of 81 interns and 82 nurses were enrolled in the study from Rajasthan (31 interns, 32
139 nurses), Maharashtra (31 interns, 50 nurses) and Delhi (19 interns). Mean (standard deviation) age
140 of interns were 23.8 (± 1.2), and nurses 29.2 (± 1.2) years. Males (50.6%) and females (49.3%) were
141 equally represented among interns, while females (66.8%) were more among nurses. **(Table 1).**

142

143 **Table 1. Background characteristics of study participants.**

Characteristics	Interns n=81 (%)	Nurses n=82 (%)	Total n=163 (%)	P value
Sex				
Male	41 (50.6)	13 (15.8)	54 (33.1)	0.593
Female	40 (49.3)	69 (84.1)	109 (66.8)	
Mean Age (standard deviation)	23.8(1.2)	29.2(3.3)	26.4(3.7)	
Age group				
20-24	66 (81.5)	4 (4.9)	70 (42.9)	0.000
24-29	15(18.5)	45 (54.9)	60(36.8)	
30-34	0	30 (36.6)	30(18.4)	
>=35	0	3 (3.6)	3(1.8)	
Years of experience				
<=1 year	81 (100)	2 (2.4)	83(50.9)	0.000
2 years	0	22 (26.8)	22(13.5)	
3 years	0	16 (19.5)	16(9.8)	
4 years	0	24 (29.3)	24(14.7)	
>=5 years	0	18 (22.0)	18(11.0)	
Marital status				
Married	7 (8.6)	70 (85.4)	77 (47.2)	0.000
Unmarried	74 (91.4)	12 (14.6)	86 (52.8)	
State				
Delhi				
* MC1	19 (23.5)	0	19 (11.7)	
Rajasthan				
MC 2	16 (19.8)	16 (19.8)	32 (19.6)	
MC 3	15 (18.5)	16 (19.8)	31 (19.0)	
Maharashtra				
MC 4	11 (13.6)	19 (23.5)	30 (18.4)	
MC 5	17 (21.0)	23 (28.4)	40 (24.5)	
MC 6	3 (3.7)	8(9.9)	11 (6.7)	

145 2.1. *Knowledge of interns and nurses regarding contraceptive methods*

146 About 60% of the interns and 48% of the nurses knew about more than 5 contraceptives that could
147 be offered through the cafeteria approach. Majority of the respondents were of the opinion that
148 condoms (88.3%) and oral contraceptive pills (OCPs) [77.9%] were the best contraceptives for
149 newly married couples. (**Table 2**). For a woman with one child, intrauterine contraceptive device
150 (IUCD) [93.4%], and for a woman with three children, sterilization (95.8%) was the most common
151 response. About one-fifth of the participants (22%) responded that the contraceptives should not
152 be given to a married woman who was coming alone. Nearly 31.9% (17.3% interns and 46.3%
153 nurses) respondents told that it was illegal to provide the contraceptives to unmarried people.
154 Knowledge of interns and nurses regarding oral contraceptive pills, condoms, and emergency
155 contraceptives is presented in **table 3**. Respondents knew the common medical conditions like
156 cardiovascular diseases (41.7%), breast diseases (30%), headache/migraine (25.7%) and
157 thromboembolic disorders (22.1%) to rule out before prescribing OCPs. Knowledge of interns and
158 nurses regarding reversible long-acting contraceptives (IUCDs and hormonal contraceptives) and
159 permanent contraceptives (tubectomy) is shown in **table 4**. Duration of protection (10 years)
160 offered by CuT 380 A was known to 51.9% interns and 35.4% nurses. About 38% were aware that
161 depot medroxyprogesterone acetate (DMPA) is available in the government supply. About 83%
162 of respondents had seen the eligibility checklist for tubectomy during their training period, but
163 only half of them (43%) had seen tubectomy operation. Similarly, the fact that amenorrhea,
164 exclusive breastfeeding and six months of the postpartum period are the three essential
165 prerequisites for lactational amenorrhea (LAM) to be an effective contraceptive method, was
166 known to 80%, 63.8%, and 48.5% respondents, respectively. Overall, the assessment of knowledge
167 in terms of correct, partial and wrong is presented in **Table 5**.

168 **Table 2. Knowledge of interns and nurses regarding various contraceptive methods**
 169 **and reproductive rights of the clients.**

Parameters	Interns n=81 (%)	Nurses n=82 (%)	Total N=163 (%)	p- value
Contraceptive choices for newly married couple*				
• Condom	74 (91.3)	70 (85.3)	144 (88.3)	0.992
• OCP	68 (83.9)	59 (71.9)	127 (77.9)	
• POP	6 (7.3)	6 (7.4)	11 (6.8)	
• IUCD	30 (36.5)	30 (36.5)	60 (36.8)	
• All	1 (1.2)	1 (1.2)	2 (1.2)	
Contraceptive choices for woman with one child				
• Condom	38 (46.9)	44 (53.7)	82 (50.3)	0.460
• OCP	44 (54.3)	47 (57.3)	91 (55.8)	
• POP	3 (3.7)	9 (11.0)	12 (7.4)	
• IUCD	75 (92.6)	77 (93.9)	152 (93.4)	
• All	0	1 (1.2)	1 (0.6)	
Contraceptive choices for woman with 3 children				
• Condom	16 (19.8)	21 (25.6)	37 (22.7)	0.907
• OCP	15 (18.5)	13 (15.8)	28 (17.2)	
• POP	1 (1.2)	2 (2.4)	3 (1.8)	
• IUCD	48 (59.3)	50 (61.0)	98 (60.1)	

• Sterilization	77 (95.1)	79 (96.3)	156 (95.8)	
Can contraceptives be given to a married woman coming alone?				
• Yes	64 (79.0)	35 (43.2)	99 (61.1)	0.000
• Yes, but after asking the family members	8 (4.9)	19 (11.7)	27 (16.7)	
• No	9 (11.1)	27 (33.3)	36 (22.2)	
Can contraceptives be given to unmarried women coming alone?				
• Yes	60 (37.0)	29 (17.9)	89 (54.9)	0.000
• Yes but after asking the family members	7 (8.6)	11 (13.6)	18 (11.1)	
• No	10 (12.4)	42 (51.9)	52 (32.1)	
Is it legal to provide contraceptives to unmarried people				
• Yes	52 (64.2)	33 (40.2)	85 (52.1)	0.000
• No	14 (17.3)	38 (46.3)	52 (31.9)	
• Don't know	15 (18.5)	11 (13.4)	26 (16)	

170 *OCP: Oral Contraceptive Pill; POP: Progesterone Pills; IUCD: Intrauterine contraceptive devices

171

172 **Table 3. Knowledge of interns and nurses regarding oral contraceptive pills, condoms and**
 173 **emergency contraceptives.**

Contraceptives	Interns n=81 (%)	Nurses n=82 (%)	Total N=163 (%)	p- value
Oral contraceptives Pills (OCPs)				
<i>Conditions to rule out from history before prescribing OCPs</i>				
• Smoking	10 (12.4)	5 (6.1)	15 (9.2)	0.060
• Diabetes	10 (12.4)	15 (18.3)	25 (15.3)	
• Headaches	24 (29.6)	18 (21.95)	42 (25.7)	
• Cardiovascular diseases	45 (55.6)	23 (28.1)	68 (41.7)	
• Thromboembolic disorders	29 (35.8)	7 (8.5)	36 (22.1)	
• Post-partum haemorrhage	7 (8.6)	2 (2.4)	9 (5.5)	
• liver disease	28 (34.6)	11 (13.4)	39 (24.0)	
• Breast disease	33 (40.7)	16 (19.8)	49 (30.6)	
<i>Instructions to be given while prescribing OCPs should include</i>				
• When to start OCP	64 (79.0)	62 (76.6)	126 (77.8)	0.471
• Daily intake without fail	71 (87.7)	67 (82.7)	138 (85.2)	
• What to do if misses a pill	56 (69.5)	41 (50.6)	97 (59.9)	
• Possible side effects	22 (27.5)	13 (16.1)	35 (21.6)	

<i>What to do if client misses 2 pills?</i>				
<ul style="list-style-type: none"> To take 2 pills the next day 	42 (51.9)	43 (53.1)	85 (52.8)	0.025
<ul style="list-style-type: none"> Again 2 pills the second next day 	16 (19.8)	12 (14.9)	28 (17.3)	
<ul style="list-style-type: none"> The couple should also use condom for 7 days 	34 (42.0)	12 (14.9)	46 (24.4)	
<i>Can OCPs be given to (yes)</i>				
<ul style="list-style-type: none"> Newly married women 	68 (84.0)	43 (52.5)	111 (68.1)	0.079
<ul style="list-style-type: none"> Illiterate women 	64 (79.0)	60 (73.2)	124 (76.1)	
<ul style="list-style-type: none"> Women who do not want any more children 	53 (65.4)	61 (74.4)	114 (70.0)	
Condoms				
<i>Failure rate of Condoms if used correctly</i>				
<ul style="list-style-type: none"> <5% 	34 (2.0)	17 (21.0)	51 (31.5)	0.002
<ul style="list-style-type: none"> 6-15% 	35 (43.2)	20 (24.7)	55 (34.0)	
<ul style="list-style-type: none"> >15% 	4 (5.0)	5 (6.2)	9 (5.6)	
<ul style="list-style-type: none"> Other 	1 (1.2)	6 (7.4)	7 (4.3)	
<ul style="list-style-type: none"> Do not know 	3 (3.7)	12 (14.8)	15 (9.3)	
<i>Two most common Advantages of condom</i>				
<ul style="list-style-type: none"> Dual protection against pregnancy and STI/HIV[^] 	70 (86.4)	47 (58.0)	117 (72.2)	0.016

• No side effects	23 (28.4)	34 (42.0)	57 (35.2)	
Emergency contraceptives				
<i>Type of contraception used after unprotected intercourse</i>				
• Emergency contraceptive pills	76 (93.8)	71 (86.6)	147 (90.2)	0.000
• Intrauterine contraceptive devices	45 (55.6)	6 (7.3)	51 (31.3)	
• Yuzpe's method	24 (29.6)	4 (4.9)	28 (17.2)	
<i>Emergency contraceptive pill is effective if consumed within</i>				
• 24 hours of unprotected intercourse	0	2 (2.4)	2 (1.2)	0.177
• 48 hours of unprotected intercourse	3 (3.7)	6 (7.32)	9 (5.5)	
• 72 hours of unprotected intercourse	77 (95.1)	68 (82.9)	145 (89.0)	
Frequency for taking centchroman				
• 1 tablet weekly	18 (22.2)	2 (2.4)	20 (12.3)	0.000
• Do not know	48 (59.3)	80 (97.6)	128 (78.5)	

174 ^STI/HIV: Sexually Transmitted Infections/Human Immunodeficiency Virus

175

176

177 **Table 4. Knowledge of interns and nurses regarding reversible long acting contraceptives**
 178 **(intrauterine contraceptive devices and hormonal contraceptives, post-partum**
 179 **contraception) and permanent contraceptives (tubectomy).**

Parameters	Interns n=81 (%)	Nurses n=82 (%)	Total n=163 (%)	P value
Awareness about types of intrauterine contraceptive devices (IUCDs)				
• Copper containing IUCDs	81 (100)	78 (95.1)	159 (97.6)	0.000
• Hormonal IUCDs	60 (74.1)	12 (14.6)	72 (44.2)	
• First generation /inert IUCDs	51 (63.0)	23 (28.1)	74 (45.4)	
Duration of protection offered by CuT 380 A				
• 10 Years	42 (51.9)	29 (35.4)	71 (43.6)	0.034
Most common conditions to rule out before inserting Copper T				
• Pregnancy	46 (56.8)	40 (48.8)	86 (52.8)	0.287
• STI/HIV	53 (65.4)	36 (43.9)	89 (54.6)	
• Irregular Periods	50 (61.7)	54 (65.9)	104 (63.8)	
• Adnexal Mass/Ectopic Pregnancy	41(50.6)	25 (30.5)	66 (40.5)	
• Multiple Sexual Partners	1 (1.2)	0	1 (0.6)	
Most common side effects of Cu-T insertion				
• Pain/cramps	61 (75.3)	55 (67.9)	116 (71.6)	0.004
• Bleeding/menorrhagia/spotting/irregular bleeding	61 (75.3)	72 (88.9)	133 (82.1)	
• Infections/PID/vaginal discharge	51 (63.0)	32 (39.5)	83 (51.2)	

• Expulsion	29 (34.6)	9 (11.1)	37 (22.8)	
When is Post-Partum IUCD (PPIUCD) to be inserted				
• Within 10 minutes of delivery	37 (45.7)	30 (36.4)	67 (41.1)	0.001
• Within 48 hours	27 (33.3)	10 (12.2)	37 (22.7)	
• During caesarean section	10 (12.4)	8 (9.8)	18 (11.0)	
• Other	26 (32.1)	11 (13.4)	37 (22.7)	
• Don't know	2 (2.5)	13 (16.0)	15 (9.3)	
Time for taking consent for PPIUCD insertion				
• Ante-natal period	40 (49.4)	29 (35.8)	69 (42.3)	0.001
• Intra-natal period	31 (38.3)	16 (19.5)	45 (28.8)	
• Post-natal period	8 (9.9)	25 (30.9)	33 (20.4)	
Questions to ask before inserting Depot Medroxy Progesterone Acetate (DMPA)				
• Pregnancy	14 (17.3)	12 (14.8)	26 (16.0)	0.639
• Irregular periods	24 (29.6)	15 (18.5)	39 (24.7)	
• Breast cancer	20 (24.7)	12 (14.9)	32 (19.8)	
• Liver diseases	9 (11.1)	5 (6.2)	14 (8.6)	
• Thromboembolic episodes	11 (13.6)	7 (8.6)	18 (11.1)	
Topics to be covered while counselling for DMPA				
• Menstruation related side effects	27 (33.3)	14 (17.2)	41 (25.2)	0.668

• Delayed return of fertility	14 (17.3)	5 (6.1)	19 (11.6)	
• Don't know	19 (23.7)	12 (15.0)	31 (19.4)	
Contraceptives that can be advised to breast feeding mother				
• Intrauterine contraceptive device	45 (55.6)	61 (74.4)	106 (65.0)	0.000
• Injectable contraceptives	8 (9.9)	9 (11.0)	17 (10.4)	
• Progesterone only Pills	31 (38.3)	6 (7.3)	37 (22.7)	
• Condoms	56 (69.1)	54 (65.9)	110 (67.9)	
Tubectomy: Have ever seen (yes)				
• Eligibility checklist for Tubectomy	12 (85.2)	14 (79.3)	26 (82.2)	
• Tubectomy operation	31 (38.3)	39 (47.6)	70 (43.0)	
• Consent form for Tubectomy	24 (29.6)	50 (61.0)	74 (45.4)	
Prerequisites for lactational amenorrhoea to be an effective contraceptive				
• Amenorrhoea	18 (22.2)	14 (83.0)	32 (80.4)	0.024
• Exclusive breast feeding	59 (72.8)	45 (54.9)	104 (63.8)	
• 6 months post-partum	43 (53.1)	36 (43.9)	79 (48.5)	
• Don't know	11 (13.8)	27 (33.3)	38 (23.6)	

181 **Table 5. Overall knowledge of interns and nurses regarding various contraceptive methods**

Parameters*	Response of Interns n=81 (%)				Response of Nurses n=82 (%)				p value
	Correct	Partially correct	Wrong	Don't know	Correct	Partially correct	Wrong	Don't know	
Contraceptive choices for newly married couple (Condom, OCP, POP, IUCD, all, few of these)	23 (28.3)	50 (61.7)	8 (9.8)	0	23 (28.0)	36 (43.0)	31 (37.8)	0 (0)	0.000
Contraceptive choices for woman with 1 child (Condom, OCP, POP, IUCD, all, few of these)	27 (33.3)	28 (34.5)	26 (32.1)	0	35 (42.3)	23 (28)	23 (28.0)	1(1.2)	0.440
Contraceptive choices for woman with 3 children (Condom, OCP, POP, IUCD, sterilization, all, few of these)	22 (27.1)	27 (33.3)	31 (38.2)	1 (1.2)	26 (31.7)	27 (32.1)	29 (34.1)	0 (0)	0.707
Can contraceptives be given to a married woman coming alone?	68 (83.9)	0	13 (16.0)		37 (45.1)	0	45 (54.8)	0 (0)	0.000
Can Contraceptives be given to unmarried women coming alone?	61 (75.3)	0	18 (22.2)	2 (2.4)	32 (39)	0	48 (58.5)	2 (2.4)	0.000
Is it legal to provide contraceptives to unmarried people?	52 (64.1)	0	14 (17.2)	15 (18.5)	33 (40.2)	0	38 (46.3)	11 (13.4)	0.000
Types of IUDs available (1 st generation, Copper, Hormonal)	18 (22.2)	15 (18.5)	48 (59.3)	0	51 (62.2)	17 (20.7)	9 (11.0)	1 (1.2)	0.000
Common contraindications for IUDs (pregnancy, STI/HIV, irregular periods/ adnexal mass, ectopic)	17 (21.0)	18 (22.0)	42 (51.9)	3 (3.7)	20 (24.4)	27 (32.9)	25 (30.5)	8 (9.8)	0.035

pregnancy, multiple sexual partners)									
Common side effects of IUDs (cramps, menstrual problems, infections, RTI/STI, expulsion)	12 (14.8)	31 (38.3)	36 (44.1)	1 (1.2)	11 (13.4)	38 (46.3)	26 (32.7)	5 (6.1)	0.16 9
Types of Cu-T in government supply (CuT375, 380A)	24 (29.6)	48 (59.3)	3 (3.7)	6 (7.4)	19 (23.2)	28 (34.1)	6 (7.3)	29 (35.4)	0.00 0
How long does Cu-T 380A offer protection?	42 (51.9 1)	0 (0)	34 (42.0)	5 (6.2)	29 (35.4)	0 (0)	37 (45.1)	16 (19.5)	0.01 6
When is PPIUCD inserted?	15 (18.5)	43 (53.1)	11 (13.6)	12 (14.8)	9 (11.0)	36 (43.9)	8 (9.8)	29 (35.4)	0.02 2
When is consent for PPIUCD taken?	61 (75.3)	0 (0)	10 (12.3)	10 (12.3)	3 (3.7)	43 (52.4)	17 (20.7)	19 (23.2)	0.00 0
Medical contraindications for OCPs (Any 4 correct responses)	21 (25.9)	0 (0)	49 (60.5)	11 (13.6)	15 (17.3)	0 (0)	35 (42.7)	32 (39.0)	0.00 1
Yes OCPs can be bought over the counter	53 (65.4)	0 (0)	24 (29.6)	4 (4.9)	52 (62.3)	0 (0)	29 (35.4)	1 (1.2)	0.32 1
Instructions given before starting OCPs	48 (59.3)	27 (33.3)	4 (4.9)	2 (2.5)	38 (46.3)	32 (39.0)	5 (6.1)	7 (8.5)	0.21 5
Instructions if 2 pills are missed	10 (12.3)	29 (35.8)	20 (24.7)	22 (27.2)	4 (4.9)	25 (30.5)	22 (26.8)	31 (37.8)	0.21 4
Whom can OCPs be given to? (Newly married women, illiterate women, Women who do not want any more children)	41 (50.6)	26 (32.1)	14 (17.3)	0 (0)	31 (37.8)	28 (34.1)	22 (26.8)	1 (1.2)	0.23 7
Which OCPs are available in govt. supply (Mala N, Mala D)	14 (17.3)	63 (77.8)	3 (3.7)	1 (1.2)	23 (28.0)	39 (47.6)	5 (6.1)	15 (18.3)	0.00 0
What kind of contraceptive is DMPA?	59 (72.8)	0(0)	8 (9.9)	14 (17.3)	32 (39.0)	0(0)	3 (3.7)	47 (57.3)	0.00 0

Medical contraindications for DMPA (Any 3 correct responses out of pregnancy/irregular periods, breast cancer, liver disease, thromboembolic episodes)	8 (9.9)	21 (25.9)	11 (13.6)	41 (50.6)	5 (6.1)	16 (19.5)	3 (3.7)	58 (70.0)	0.03 1
Common side effects of DMPA (menstruation related side effects, delayed return of fertility)	9 (11.1)	22 (27.2)	4 (4.9)	46 (56.8)	4 (4.9)	12 (14.6)	2 (2.4)	64 (78.0)	0.03 7
Yes injectable contraceptives are available in the government supply	36 (44.4)	0	33 (40.7)	12 (14.8)	28 (34.1)	0	28 (34.1)	26 (31.7)	0.03 8
Prerequisites for lactational amenorrhea (amenorrhoea, exclusive breast feeding for 6 months)	8 (9.9)	44 (54.3)	15 (18.5)	14 (17.3)	10 (12.2)	25 (30.5)	17 (20.7)	30 (36.6)	0.01 0
Contraceptives that can be given to breastfeeding women (Condoms, POP, IUCD, Injectable)	14 (17.3)	45 (55.6)	16 (19.8)	6 (7.4)	14 (17.1)	35 (42.7)	26 (31.7)	7 (8.5)	0.29 6

182 *OCP: Oral Contraceptive Device; POP: Progesterone Only Pill; IUCD: Intrauterine
 183 Contraceptive Device; DMPA: Depot medroxy progesterone acetate, PPIUCD: Post Partum
 184 Intrauterine Contraceptive Device; STI/HIV: Sexually Transmitted Infections/Human
 185 Immunodeficiency Virus

186 There were non-significant differences in the knowledge as per the age and gender of the
187 participants. However, it was observed that information regarding the legality of contraceptives to
188 be given to unmarried people significantly ($p=0.049$) improved with age among nurses, as 65% of
189 the nurses between 30-34 years have answered it correctly as compared to 32.7% and 28.6%
190 among 25-29 years and 20-24 years age group, respectively. Female interns had significantly better
191 knowledge as compared to male interns regarding the choice of contraceptives for women with
192 one child (47.5% vs 24.4%; $p=0.036$), with three children (45% vs 17.1%; $p=0.042$); and regarding
193 types of IUCDs (90% vs 65.9%; $p=0.009$).

194

195 2.2. *Skills of nurses and interns regarding the use of contraceptive methods (Objective*
196 *structured clinical examination)*

197

198 About 19.8% interns and 64.6% nurses refused to demonstrate the use of MEC wheel for choosing
199 the best contraceptives for hypothetical cases, as shown in **Table 6**. Further, 43.2% interns and
200 69.5% nurses refused, while 12.2 % nurses and 44.4% interns passed in demonstrating CuT
201 insertion in dummy uterus. Correct steps of using a condom on the thumb were demonstrated by
202 63% interns and 40.2% nurses.

203

204 **Table 6. Objective structure clinical examination (OSCE) score of interns and nurses.**

205

Parameters	Interns n=81 (%)	Nurses n=82 (%)	p-value
Medical eligibility criteria (MEC) wheel demonstration			
• Pass	57 (70.4)	22 (26.8)	0.148
• Fail	8 (9.9)	7 (8.5)	
• Refused to demonstrate appropriate usage of MEC	16 (19.8)	53 (64.6)	
Intrauterine contraceptive device (IUCD): Cu T			
• Pass	36 (44.4)	10 (12.2)	0.000
• Fail	10 (12.3)	15 (18.3)	
• Refused to perform demonstration of Cu T insertion	35 (43.2)	57 (69.5)	
Steps for CuT insertion			
• Washes hands and wears gloves	31 (38.3)	15 (18.3)	0.729
• Insert the sterile sound with 'no touch' technique	38 (46.9)	12 (14.6)	
• Load IUCD in its sterile package	31 (38.2)	7 (8.6)	
• Set the blue depth gauge to the measurement of the uterus	29 (35.8)	9 (11.0)	
• Carefully insert the loaded IUCD and release it into the uterus	40 (49.4)	14 (17.1)	
• Take out the plunger	31 (38.3)	15 (18.3)	
• Partially withdraw the insertion tube till the string are visible	24 (29.6)	9 (11.0)	

<ul style="list-style-type: none"> Use sterile scissors to cut the IUCD strings to 3-4 cm length in the vagina 	20 (24.7)	11 (13.4)	
Barrier contraceptive usage (Condom)			
<ul style="list-style-type: none"> Pass 	51 (63.0)	33 (40.2)	0.348
<ul style="list-style-type: none"> Fail 	15 (18.5)	12 (14.6)	
<ul style="list-style-type: none"> Check the expiry date on the wrapper 	1 (1.2)	3 (3.7)	
Steps for condom usage			
<ul style="list-style-type: none"> Open the package without tearing the condom 	64 (79)	42 (51.2)	0.985
<ul style="list-style-type: none"> Do not use teeth to open the wrapper 	64 (79.0)	41 (50.0)	
<ul style="list-style-type: none"> Hold the condom by the last ½ inch at the tip, making sure to squeeze out any air 	31 (38.3)	19 (23.2)	
<ul style="list-style-type: none"> Put the condom on the tip of the thumb. 	61 (75.3)	38 (46.3)	
<ul style="list-style-type: none"> While still pinching the tip, unroll the condom down the shaft, to the base 	33 (40.47)	27 (32.9)	
<ul style="list-style-type: none"> Remove the condom by rolling it off 	51 (63.0)	31 (37.8)	
<ul style="list-style-type: none"> Throw the condom into the dustbin 	39 (48.1)	24 (29.3)	

206

207

208 2.3. *Status of prevailing FP practices*

209

210 Almost 90% of interns received training on FP methods and services, and 76.5% were also posted
 211 in FP clinics (**Table 7**). Although 63% interns and nurses have seen the insertion of IUCD, more
 212 nurses (17.1%) reported performing IUD insertion than interns (12.3%) at least once. A very small
 213 proportion of interns and nurses reported having seen implantable contraceptives (12.3%) and

214 spermicides (17.3%). All the medical colleges reported conducting training of students for FP
 215 methods and services. The details pertaining to infrastructure and facilities are depicted in
 216 Supplementary Table 1. None of the colleges had a MEC wheel for training purposes. Adequate
 217 stock of FP methods (contraceptives, pregnancy test, CuT etc.) was available in almost all the
 218 colleges, but only 3/6 medical colleges reported to have an established FP logistic management
 219 information system, as depicted in Supplementary Table 2.

220 **Table 7. Status of training of interns and nurses on family planning (FP) methods and**
 221 **services.**

	Interns n=81 (%)	Nurses n=82 (%)	p-value
Status of Training*			
• Attended a class on FP methods during training	73 (90.1)	64 (78.0)	0.035
• Posted in FP clinic	62 (76.5)	38 (46.3)	0
• Observed counseling on different FP methods	48 (59.3)	57 (69.5)	0.172
• Ever seen MEC wheel	10 (12.3)	6 (7.3)	0.281
• Ever observed MEC wheel used for a patient	6 (7.4)	4 (4.9)	0.501
Number of students who have ever*			
• Observed IUCD insertion	51 (63.0)	52 (63.4)	0.952
• Performed IUCD insertion	10 (12.3)	14 (17.1)	0.394
• Inserted IUCD on dummy/ model	9 (11.1)	11 (13.4)	0.645

• Observed IUCD removal	26 (32.1)	42 (51.2)	0.013
• Performed IUCD removal	16 (19.8)	23 (28.0)	0.215
Number of students who have ever seen			
• Condom	78 (96.3)	82 (100)	0.079
• Oral Contraceptive Pill	78 (96.3)	80 (97.6)	0.64
• Intrauterine Device	80 (98.8)	81 (98.8)	0.993
• Depot medroxy progesterone acetate	32 (39.5)	28 (34.1)	0.478
• Emergency Contraceptive Pill	64 (79.0)	63 (76.8)	0.737
• Centchroman	29 (35.8)	19 (23.2)	0.077
• Hormonal IUCD	38 (46.9)	9 (11.0)	0
• Implantable Contraceptives	10 (12.3)	13 (15.9)	0.52
• Spermicides	14 (17.3)	5 (6.1)	0.026

222 *MEC: Medical Eligibility Checklist; IUCD: Intrauterine contraceptive device

223

224

225 3. Discussion

226 This study highlights the partial knowledge and skills of the interns and nurses regarding family
227 planning services in the medical colleges in Rajasthan, Maharashtra, and Delhi, India. The status
228 of training regarding these services was also found to be inadequate. These results have any
229 implications in terms of providing universal access to quality reproductive and sexual health to the
230 clients, which may lead to a compromise in the reproductive rights of the population, especially of
231 the women, as they are most often not the decision makers in opting for the FP methods.

232
233 Our study sample had proportionate representation from male (54, 33.1%) and female (109,66.9%)
234 groups. A higher proportion of females were because the majority of the nurses were females
235 (84.1%). Significantly higher knowledge of female participants as observed in this study is similar
236 to Raselekoane NR (2016) study, who reported a non-serious approach of the male students
237 towards contraception and family planning [11]. Gender differences should not be ignored during
238 medical educations to avoid compromise with the sexual and reproductive health rights of the
239 clients.¹² Amongst nurses, improvement in knowledge in certain topics with age may be attributed
240 to change in marital status and hence clarity of certain concepts. However, it is recommended to
241 have in job refresher training programs as a routine activity.

242
243 It was observed that participants did not report to provide FP methods as per cafeteria approach to
244 an eligible woman [**Error! Bookmark not defined.**]. Most of them were unaware of the new FP
245 methods [like DMPA (86%)] that have been introduced in India [13]. Rhythm method (87.9%),
246 coitus interrupts (55.4%), LAM (45.2%) were preferred natural methods during counseling.
247 Fehring RJ et al (Missouri, 1999), also observed that health care providers were likely to

248 recommend calendar calculations and monitoring basal body temperature to their clients for
249 managing pregnancies [14]. IUCD, condom, and sterilization were preferred contraceptives for
250 newly married women, for women with one child and for women with three children. Jain AK et
251 al (India, 2017), observed 15.6% of contraceptive users receiving information on all four items
252 (IUCDs, condom, sterilization, and pill) [15]. In our study, 32.1% of participants reported that FP
253 services should not be offered to unmarried females coming alone, and 31.9% of participants
254 reported that providing FP services to unmarried people is illegal. Tilhaun et al study (Ethiopia,
255 2010) also observed a negative attitude toward providing FP methods to unmarried adolescents
256 [16]. Sociocultural norms of Indian society contribute in having sex-related issues a taboo and
257 hinder young people from seeking counseling regarding sexual health [17]. It has been reported
258 earlier that that healthcare providers often impose unnecessary barriers in dispensing
259 contraceptives, including denial of a contraceptive method on the basis of age, parity, marital status
260 or lack of parental or spousal authorization [18, 19].

261
262 Knowledge regarding side effects and contraindications of IUCD use (68.7%) was better than other
263 studies done in the past [20, 21]. This may be attributed to improvement in health promotion
264 activities conducted in the last decade. Few interns (12%) had adequate knowledge about
265 instructions that should be given to a woman who had missed up to two doses of her OCPs. These
266 findings are in line with a study by Rutter W et al (Australia 1988) [22]. Adequate knowledge of
267 interns and nurses regarding male condoms (72%) in this study is similar to the observations made
268 by Simbar et al study (Iran 2005) [23].

269

270 More than 60% participants were clueless about injectable contraceptives particularly DMPA.
271 Hogmark et al (India, 2013), reported that despite the positive attitude of medical students towards
272 modern contraceptives, sex education and FP counseling, they still had misconceptions about
273 modern methods of contraception in Maharashtra, which is consistent with the findings of the
274 present study [24]. Knowledge about LAM was partial, as only 9.9% interns and 12.2% nurses
275 (Supplementary table 1) could correctly enumerate three criteria of LAM (Table 4) to be an
276 efficacious method [25]. Singh S et al (Delhi, 2002) observed high awareness about emergency
277 contraception among doctors who felt that the use of emergency contraceptives can bring down
278 the number of induced abortions [26]. Less than half of the respondents (61% nurses; 30% interns)
279 had ever witnessed tubectomy operation, while 16% had seen eligibility checklist and 45.5 % had
280 seen the consent form for tubectomy. This difference is probably because taking consent from
281 patients is primarily a job responsibility of nurses in India.

282
283 Availability of adequate logistics is an essential part of pre-service trainings and helps students to
284 adhere to the standard protocols with the clients. A similar study reported difficulties in delivering
285 quality services as per the protocols, which were attributed to improper facility layout and lack of
286 furniture [27]. Inadequate logistics and privacy may also have an effect on the client's satisfaction
287 [28, 29].

288
289 One of the main strength of our study was the use of reliable and valid method i.e., OSCE, to assess
290 the skills of the study participants [30,31,32]. Some nurses refused to demonstrate the procedure of
291 using a condom, which could be linked with shyness, or with unawareness of the correct procedure.
292 This has implications on proper demonstration of condom usage to the clients, which may lead to

293 higher failure rates and inconsistent use of condoms. This may also result in increased use of
294 emergency contraceptives in the population at high risk of unintended pregnancy. Lim MS et al
295 (China, 2015) has stressed that efforts should be made to sensitize the students to rise above and
296 overcome this social taboo, and emphasis should be given to training in skills for
297 condom/contraception negotiation, as partner refusal to use condoms is common [33]. The use of
298 MEC wheel during pre-service training should be stressed upon as it aims to provide guidance to
299 health-care providers in decision making and minimizing errors [34].

300
301 We did not assess the knowledge of the teachers regarding family planning services, which could
302 have helped us to identify gaps in the medical education pattern; and of the participants regarding
303 female condoms, which should be promoted to reduce the sexually transmitted infections [35].
304 Since this was a cross-sectional study, and information was self-reported hence, there could be a
305 chance of recall and social desirability bias. Though interviews were conducted with one
306 respondent at one time in closed room settings, yet response bias could be there due to prior
307 interpersonal communication among the participants.

308
309 Based upon the results of this study it is recommended that training of interns and nurses on FP
310 services should be given more emphasis during the medical education. Internship duties should
311 include a minimum set of procedures and duties regarding FP services, and skills and knowledge
312 acquired should be assessed by conducting the exit tests. Faculty members of the medical college
313 should take the responsibility of teaching their students with a more serious approach towards FP
314 services to ensure universal access to sexual and reproductive health care services and rights.

315

317 **Acknowledgments**

318 We are thankful to Prof Rajesh Kumar, Dean (Academics), Professor and Head of Department
319 of Community Medicine to provide guidance throughout the conduct of this study. We would
320 like to extend our gratitude to Dr. Pravin H Shingare, Director of Medical Education and
321 Research, Government of Maharashtra, Dr Ajay S Chandanwale, Dean, BJ Medical College
322 Pune, Dr Nanandkar Sudhir Digambar, Dean, Grant Medical College and Sir JJ Group of
323 Hospital Mumbai, Maharashtra; Dr S Ramji, Dean, Maulana Azad Medical College, New
324 Delhi; Dr RK Ghokroo, Principal, Jawaharlal Nehru Medical College, Ajmer, Rajasthan, Dr
325 SS Rathore, Dean, Sampuranand Medical College, Jodhpur, Rajasthan, for permitting us to
326 conduct this study in their respective institutions within the study states. We would also like to
327 thank Dr. Rajkrishna Ravikumar, for data collection in Rajasthan and Delhi.

328

329 **Financial support**

330 This study was supported technically and financially by United Nations Population Fund
331 (UNFPA), New Delhi, Country Office [*Global Programming Systems (GPS) ID: 83059;*
332 *Reference: IND8U303, dated 4th October 2017*]. The National Program Officer (*co-author*
333 *Iyengar K*), at UNFPA, had provided technical inputs in the study design, data collection,
334 analysis and interpretation of the results, report writing and the decision to submit the article
335 for publication

336

337 **Additional Author information:**

338 **1. Madhu Gupta, MD, Ph.D.** ^a

339 ^a Professor, Department of Community Medicine and School of Public Health
340 Postgraduate Institute of Medical Education and Research, Chandigarh, 160012. India.

341 Mobile: +917087008223; +917009769629

342 Email: madhugupta21@gmail.com.

343 **2. Madhur Verma, MD** ^{a, b}

344 ^a Senior Resident, Department of Community Medicine and School of Public Health,
345 Postgraduate Institute of Medical Education and Research, Chandigarh, 160012

346 ^b Assistant Professor, Department of Community Medicine,
347 Kalpana Chawla Government Medical College,
348 Karnal, Haryana. 132001. India.
349 Mobile no:+919466445513

350 Email: drmadhurverma@gmail.com.

351 **3. Kiranjit Kaur, MPH** ^a

352 ^a Research Officer, Department of Community Medicine and School of Public Health
353 Postgraduate Institute of Medical Education and Research, Chandigarh, 160012. India.

354 Mobile no:+918699291784

355 Email: kiranjitkaur02@gmail.com.

356 **4. Kirti Iyengar, MD, PhD** ^c

357 ^c National Programme Officer (Reproductive Health & HIV/ AIDs)

358 United Nations Population Fund, 55 Lodi Estate, New Delhi 110003. India.

359 Mob: +91 9799498350

360 Email: iyengar@unfpa.org.

361 **5. Tarundeep Singh, MD** ^a

362 ^a Assistant Professor, Department of Community Medicine and School of Public Health
363 Postgraduate Institute of Medical Education and Research, Chandigarh, 160012. India.
364 **Email:** tarundeep.singh@gmail.com.

365 **6. Anju Singh, MD^d**

366 ^d Assistant Professor, Department of Obstetrics and Gynaecology
367 Postgraduate Institute of Medical Education and Research, Chandigarh, 160012. India.
368 **Email:** Singha1712@gmail.com.

369

370 **References**

[i] Glasier A, Gülmezoglu AM. Putting sexual and reproductive health on the agenda. *The Lancet*. 2006 Nov 4;368(9547):1550-1.

[ii] World Population Prospects, The 2017 Revision: Data Booklet. Department of Economic and Social Affairs, Population Division (2017), United Nations. Available at <http://www.un.org/en/development/desa/population/publications/databooklet/index.shtml>.

[iii] The World Bank Data. India. Available from: <https://data.worldbank.org/country/india>. [cited: 2018, July 20].

[iv] Sample registration system. SRS Statistical Report 2016. New Delhi: Office of the Registrar General and Census Commissioner, Ministry of Home Affairs; 2016. Available from: http://www.censusindia.gov.in/vital_statistics/SRS_Reports__2016.html. [cited: 2018, July 20].

[v] International Institute of Population Sciences. Ministry of Health and Family Welfare. The government of India. National Family Health Survey. Round 4. India Fact Sheet. 2015-16. [cited 2018, May 14]. Available from: <http://rchiips.org/NFHS/pdf/NFHS4/India.pdf>.

-
- [vi] Family Planning Division. Ministry of Health and Family Welfare Government of India. India's 'VISION FP 2020'. 2014. [cited 2018, May 14] Available from: <https://advancefamilyplanning.org/sites/default/files/resources/FP2020-Vision-Document%20India.pdf>.
- [vii] Pachauri S. Expanding contraceptive choice in India: Issues and evidence. *J Fam Welfare*. 2004;⁵⁰:13–25.
- [viii] Ghooi RB, Deshpande S. Evidence-based medicine: A non-starter in India? *Indian J Health Sci Biomed Res*. 2016;9:121-6.
- [ix] Kumar J, Hardee K. Rights-based family planning: 12 resources to guide programming. Resource guide. USAID. 2017. [cited 2018, May 14] Available from: http://ec2-54-210-230-186.compute-1.amazonaws.com/wp-content/uploads/2017/04/Resource-Guide-of-RBA-to-FP-Updated-April_2017.pdf.
- [x] Dean AG, Sullivan KM, Soe MM. OpenEpi: Open Source Epidemiologic Statistics for Public Health, Version. www.OpenEpi.com, updated 2013/04/06, accessed 2018/07/05.
- [11] Raselekoane NR, Morwe KG, Tshitangano T. University of Venda's male students' attitudes towards contraception and family planning. *African journal of primary health care & family medicine*. 2016;8(2):1-7.
- [12] Kabagenyi A, Jennings L, Reid A, Nalwadda G, Ntozi J, Atuyambe L. Barriers to male involvement in contraceptive uptake and reproductive health services: a qualitative study of men and women's perceptions in two rural districts in Uganda. *Reproductive health*. 2014 Dec;11(1):21.

-
- [13] Current family planning programme under public sector; National health mission. Ministry of Health and Family Welfare Government of India. 2018. [cited 2018, August 29]. Available from: <http://nhm.gov.in/nrhm-components/rmnch-a/family-planning/background.html>.
- [14] Fehring RJ, Hanson L, Stanford JB. Nurse-midwives' knowledge and promotion of lactational amenorrhea and other natural family-planning methods for child spacing. *J Midwifery Women's Heal*. 2001;46(2):68–73.
- [15] Jain AK. Information about methods received by contraceptive users in India. *J Biosoc Sci* [Internet]. 2017 Nov 8 [cited 2017 Dec 26];49(6):798–810. Available from: https://www.cambridge.org/core/product/identifier/S0021932016000602/type/journal_article
- [16] Tilahun M, Mengistie B, Egata G, Reda AA. Health workers' attitudes toward sexual and reproductive health services for unmarried adolescents in Ethiopia. *Reprod Health*. 2012;9(1):1–7.
- [17] Nath A. HIV/AIDS and Indian youth—a review of the literature (1980–2008). *SAHARA J* 2009;6:2–8.
- [18] Brown SS, Burdette L, Rodriguez P. Looking inward: provider-based barriers to contraception among teens and young adults. *Contraception*. 2008;78:355–7. 22.
- [19] Campbell M, Sahin-Hodoglugil NN, Potts M. Barriers to fertility regulation: a review of the

literature. *Stud Fam Plann.* 2006;37:87–98

- [20] Najafi F. Investigation of Knowledge and Attitude of Family Health Workers about IUD, Norplant, and DMPA in Health Care Centres in East of Guilan Between 2001-2002. *J Guilan Univ Med Sciences.* 2004 15;13(50):14-21.
- [21] van Zijl S, Morrioni C, van der Spuy ZM. A survey to assess knowledge and acceptability of the intrauterine device in the Family Planning Services in Cape Town, South Africa. *J Fam Plann Reprod Health Care.* 2010;36(1):73–8.
- [22] Rutter W, Knight C, Vizzard J, Mira M, Abraham S. Women’s attitudes to withdrawal bleeding and their knowledge and beliefs about the oral contraceptive pill. *Med J Aust [Internet].* 1988 Oct 17 [cited 2018 Jan 9];149(8):417–9.
- [23] Simbar M, Tehrani FR, Hashemi Z. Reproductive health knowledge, attitudes, and practices of Iranian. *East Mediterr Heal J.* 2005;11:888–97.
- [24] Hogmark S, Klingberg-Allvin M, Gemzell-Danielsson K, Ohlsson H, Essén B. Medical students’ knowledge, attitudes and perceptions towards contraceptive use and counselling: a cross-sectional survey in Maharashtra, India. *BMJ Open [Internet].* 2013. [cited 2018 Jan 1];3(12):e003739. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/24334156>
- [25] Hight-Laukaran V, Labbok MH, Peterson AE, Fletcher V, von Hertzen H, Van Look PF, et

-
- al. Multicenter Study of the Lactational Amenorrhea Method (LAM): II. Acceptability, Utility, and Policy Implications. [cited 2018 Jan 5]; Available from: http://irh.org/wp-content/uploads/2013/04/Hight-Laukaran_1997_multicenter_study_of_LAM_II.pdf.
- [26] Singh S, Mittal S, Anandalakshmy PN, Goel V. Emergency contraception: Knowledge and views of doctors in Delhi. *Heal Popul Perspect Issues*. 2002;25(1):45–54.
- [27] Atuahene MD, Afari EO, Adjuik M, Obed S. Health knowledge, attitudes, and practices of family planning service providers and clients in Akwapim North District of Ghana. *Contraception and reproductive medicine*. 2016;1(1):5.
- [28] Ndulo J. Quality of care in sexually transmitted diseases in Zambia: patients' perspectives. *East Afr Med J*. 1995;72(10):641–44. 32.
- [29] Whittaker M, Mita R, Hossain B, Koenig M. Evaluating rural Bangladeshi women's perspectives of quality in family planning services. *Health Care Women Int*. 1996;17(5):393–411.
- [30] Grand'Maison P, Lescop J, Rainsberry P, Brailovsky CA. Large-scale use of an objective, structured clinical examination for licensing family physicians. *Cmaj*. 1992;146(10):1735–40.
- [31] Bartfay WJ, Rombough R, Howse E, Leblanc R. Evaluation. The OSCE approach in nursing

education. *Can Nurse* [Internet]. 2004 Mar [cited 2017 Dec 23];100(3):18–23. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/15077517>

[32] Alinier G, Hunt B, Gordon R, Harwood C. Effectiveness of intermediate-fidelity simulation training technology in undergraduate nursing education. *J Adv Nurs* [Internet]. 2006. [cited 2018 Jan 1];54(3):359–69. Available from: <http://doi.wiley.com/10.1111/j.1365-2648.2006.03810.x>

[33] Lim MS, Zhang XD, Kennedy E, Li Y, Yang Y, Li L, Li YX, Temmerman M, Luchters S. Sexual and reproductive health knowledge, contraception uptake, and factors associated with unmet need for modern contraception among adolescent female sex workers in China. *PloS one*. 2015 27;10(1):e0115435.

[34] World Health Organization. Medical Eligibility Criteria wheel for Contraceptive use. 2015. [cited 2018 Sep 21]. Available from http://www.who.int/reproductivehealth/publications/family_planning/mec-wheel-5th/en/.

[35] Mashanda-Tafaune B, Monareng LV. Perception and attitude of healthcare workers towards the use of a female condom in Gaborone, Botswana. *health sa gesondheid*. 2016 Dec 31;21:162-70.