INTRODUCTION

Infertility is currently a public health problem that has increased rapidly in recent times. According to the World Health Organization (WHO), infertility was a global health problem that affects about 17.5% of people in reproductive age (about 1 person in 6 people). According to research Nguyen Viet Tien et al (2010) found that the infertility rate in Vietnam was 7.7% on average, of which the primary infertility rate was 3.9% and the secondary infertility rate was 3.8%.

Infertility in couples was caused by many different causes but is divided into two main groups: female infertility and male infertility. In fact, it is often difficult for an infertile spouse to recognize their diseases, all health problems can still occur normally, and there is no reason to cause them to see a doctor immediately. But treatment results depend on many factors, including early and proper treatment. Therefore, disease prevention, initial examination and infertility counseling play a particularly important role. That is the reason why we chose to research the topic ***"The prevalence of infertility among couples in reproductive age and the effectiveness of some intervention solutions in Thai Nguyen province"***, with 3 objectives:

1. Describe the prevalence of infertility among couples in reproductive age at Thai Nguyen province in 2018.

2. Analyze some related to factors of infertility among couples in reproductive age

3. Evaluate the effectiveness of some intervention solutions to improve consultation and initial examination of infertility of primary health care providers (HCPs).

The necessary of dissertation

Thai Nguyen is a mountainous province in the Northern region of Vietnam. Like other provinces in the country, Thai Nguyen's infertility rate has trended to increase in recent years. Research to understand the prevalence of infertility in Thai Nguyen as well as intervention solutions to improve consultation and initial examination of infertility by primary HCPs in Thai Nguyen was still limited.

The new contribution of dissertation

This is the first research project to survey the prevalence of infertility and appropriate and effective intervention solutions to improve the capacity of consultation and initial examination for infertility of primary HCPs.

The structure of dissertation

The dissertation had 135 pages, include: introduction (2 pages), literature review (30 pages), subject and research methods (22 pages), research results (46 pages), discussion (32 pages), conclusion (2 pages), recommendation (1 page). The dissertation have 45 tables, 3 figures and 5 boxes, 109 references documents with 40 Vietnamese documents and 69 English documents.

Chapter 1

LITERATURE REVIEW

1.2. Infertility situation in the world and in Vietnam

1.2.1. Some concepts about infertility

1.2.1.1. Definition of infertility

According to the definition of the World Health Organization (WHO), infertility is a condition in which a couple wishes to become pregnant and has regular sexual activity without using any contraceptive method but no pregnant within 12 months, in older women (over 35 years old), this duration is 6 months. In some abnormal cases, such as women who have not had menstruation after the age of 18, or adult men with impotence, were concluded to be infertile.

1.2.1.2. Classification of infertility

- Primary infertility, also known as infertility I, was having no pregnancy in the past.

- Secondary infertility, also known as infertility II, was having at least one pregnancy in the past.

1.2.2. Infertility situation in the world

According to the report of Snow M and colleagues on infertility rates in the US, the infertility rate in couples was 6.9%, 7.0%, 5.8%, 6.3%, 7 ,0%, 7.2%, and 8.1% in 1995, 2002, 2006–2010, 2011–2013, 2013–2015, 2015–2017, and 2017–2019, respectively. In Africa, according to a comprehensive study, the infertility rate was about 16%. Author Zhou Z showed that, in China, the infertility rate was 25%. Author Liang S pointed out that primary infertility accounted for 6.54%, secondary infertility accounted for 18.04%. In general, the infertility rate ranged from 10% - 20%, of which the causes of infertility in men and women were similar. This rate tends to increase, the rate of infertility with unknown causes was still high.

1.2.3. Infertility situation in Vietnam

In Vietnam, according to Nguyen Viet Tien and colleagues (2010), the infertility rate in Vietnam was on average 7.7%. Of these, the rate of primary infertility was 3.9% and secondary infertility was 3.8%. According to a study in 2021 by author Kim NI and colleagues, the infertility rate in Vietnam was 5%, of which primary infertility accounted for 1.4% and secondary infertility accounted for 3.6%. In Trinh Hung Dung's study, infertility due to the wife accounted for 45.1%, infertility due to the husband accounted for 37.6% and infertility due to both spouses was 9.2%.

1.3. Some related factors for infertility

1.3.1. Factors related to biological characteristics of husband and wife

1.3.1.2. Some related factors of female infertility

* Genital tract infections

Some agents cause inflammation, such as Candidas Albrican, Clamydia Trachomatis, flagellate, gonorrhea, syphilis... Infections change vaginal's pH, affecting the ability to survive of sperm before entering the uterus. Affects ability to conceive. Genital inflammation is recognized as a common cause of infertility in developing countries. According to research by Nguyen Duc Vy (2003) at the National Obstetrics Hospital, 57.6% of infertile subjects studied have had/and are currently suffering from genital inflammation.

* History of obstetrics and gynecology

History of childbirth, such as infected birth, miscarriage, abortion... leading to complications of postpartum infection and bleeding are the leading causes of secondary infertility. Gynecological diseases that are not treated promptly, such as uterine fibroids, uterine polyps, ovarian tumors... Pelvic surgery, fallopian tube surgery... are also the cause of infertility accounts for a large proportion. According to Tran Hoang Nhat Anh, the cause of ovulation disorder accounts for 60%, of which polycystic ovary syndrome accounts for 44%.

1.3.1.3. Some related factors of male infertility

* History of genital infections

Including orchitis (due to mumps, syphilis, gonorrhea...), inflammation of the seminal tract (epididymis, seminal vesicles, prostate), and urethritis. Men with a history of genital inflammation increase the risk of infertility.According to authors Nguyen Hoai Bac

and Pham Minh Quan, 9.3% of male infertility was due to varicocele, 5.6% was due to orchitis caused by mumps, and 0.9% was due to genital tract infections with other causes.

* History of testicular trauma

Due to a fall, an injury can contuse the testicles, leading to testicular atrophy later on. Surgery in the groin area can damage the blood vessels that nourish the testicles and spermatic cord. History of testicular traumaincreases the risk of azoospermia.

1.3.2. Related factors in the behavior of husband and wife

1.3.2.1. Nutrition

- For women, nutritional anemia, a lack of healthy red blood cells, also causes infertility, caused by iron deficiency or insufficient vitamin B12 and folate. A balanced, reasonable diet will positively impact fertility.

1.3.4. Related factors belong to the health care system

To detect and treat, patients need to have basic knowledge and go to the doctor early and at the right specialist. In addition, screening for early detection and timely treatment of abnormalities of the reproductive organs and diseases that can cause infertility plays an important role in preventing infertility in men. and women. That is why the role of the health care system, especially reproductive health care, is extremely important, especially at the primary health care system. According to research results by Bui Dong Tien and colleagues in Ho Chi Minh City, infertility patients believed that communication activities about infertility were limited, with poor content and form. This led to people lacking knowledge about infertility such as the causes and diagnosis of infertility and this was the cause of delays in infertility treatment.

1.4. Community intervention for infertility

- Intervention to improve the capacity of health workers on issues related to infertility: Organize training and retraining for commune health care providers in commune and village, update information and provide documents related to reproductive health and infertility prevention. According to some content mainly related to infertility.

- Intervention to improve KAP on reproductive health for couples of childbearing age in intervention communes: Communication to change behavior, early recognition of signs and risks leading to infertility. Provide learning materials, provide leaflets with content

on how to prevent genital infections, use of contraceptive drugs and devices, and factors related to infertility.

Chapter 2.
RESEASRH SUBJECTS AND METHODS

2.1. Quantitative and qualitative research subjects

2.1.1. Research subjects for objective No.1 and No.2

- Couples of childbearing age from 18 to 49 years old (in accordance with the 2014 Law on Marriage and Family, which stipulates that women are allowed to marry when they are 18 years old.

2.1.2. Research subjects for objective No.3

- Primary HCPs of reproductive health care at district hospitals, district medical centers, commune, ward or town, including doctors, nurses or midwives.

2.2. Research place

For descriptive research: select 12 communes and wards, in Thai Nguyen city, Phu Binh district and Vo Nhai district. For intervention research, Vo Nhai and Phu Binh districts were purposefully selected to participate in the study.

2.3. Research period: From January 2018 to May 2020, divided into 3 periods.

2.4. Research methods

2.4.1. Descriptive research

Using cross-sectional descriptive research method, combining qualitative and quantitative.

2.4.1.2. Cỡ mẫu cho nghiên cứu định lượng

- For descriptive research, The sample size was calculated according to the formula:

$$n = Z^2_{1-\alpha/2} \; \frac{p\,(1-p)}{d^2}$$

Z(1-α/2): Reliability coefficient (With 95% confidence, Z(1-α/2 = 1.96); p: Rate of infertile couples, according to previous research is 7.7%, p = 0.077; d: desired deviation, choose d = 0.01. Calculated n =2257 pairs, plus 10% to prevent dropouts due to long-term research and limited error. The calculated minimum sample size was 2482 people, rounded n = 2500 couples.

2.4.1.3. Sampling for quantitative descriptive research

Use stratified sampling method to select samples to participate in the study.

2.4.1.4. Sample size and sampling for qualitative research

Collect qualitative data, through 18 in-depth interviews and 9 group discussions to supplement for quantitative research.

2.4.3. Intervention research

2.4.3.1. Research design

Community Controlled experimental study, combining qualitative and quantitative.

2.4.3.2. Sample size of intervention studies

- Intervention sample size

+Intervention group - Phu Binh district: Select all primary HCPs, including doctors, nurses and midwives in charge of reproductive health care at the district hospital, district health center, commune, ward or town health station in Phu Binh district are included in the intervention group, the study selected 41 health care providers to participate in the intervention group. Control group - Vo Nhai district 30 health care providers were selected to participate in the control group.

2.5. Intervention content

* *Scientific background for developing intervention solutions:* Based on the results of the infertility survey in phase 1 and analysis of related factors as well as analysis of in-depth interview results and discussions for developing an intervention program that impacts two target groups: primary HCPs and couples of childbearing age.

2.5.1. Intervention methods

* *Activity 1. Training/Workshop*

Organize 01 training course***"Improving competence for examination and consultation about infertility for primary HCPs"***.

* *Activity 2. Health education about infertility*

Carry out indirect communication about infertility in the following forms: Distributing leaflets, hanging banners, slogans, posters, broadcasting through loudspeakers, television... Combined with carrying out direct health education about infertility through health talks, group discussions, and health advice on infertility.

* *Activity 3. Supportive supervision and practice training to improve capacity for initial examination and consultation on infertility*

After training, primary HCPs carry out initial examination and consultation on infertility in their station. The trainers of the training

course go to the area to supervise the initial examination and infertility counseling of primary HCPs once a month for 12 months.

2.5.2. Intervention solutions using specialized techniques

- Intervention to improve the capacity of health workers on issues related to infertility. Organize training and retraining for commune health workers and hamlets, update information and provide documents related to reproductive health care and infertility prevention.

2.6. Research variables and indicators

2.61. Research variables and indicators for objective 1

* *Variables on demographic characteristics:* Age, occupation, education level, ethnicity, religion.

* *Variables and indicators of infertility rate:* Prevalence of infertility among couples of reproductive age

2.6.2. Research variables and indicators for objective 2.

Dependent variable: Infertility prevalence. Independent variable: age group, physical condition, behavior, obstetric history, and the role of primary HCPs

2.6.3. Research variables and indicators for objective 3

* General information of primary HCPs

* Infertility examination and counseling capacity of primary HCPs: Knowledge, attitude, and skills on infertility examination and counseling.

* Effective intervention in infertility examination and counseling capacity of primary HCPs:

- Intervention effectiveness in improving knowledge, attitudes, and skills in infertility examination and infertility counseling of primary HCPs.

2.7. Evaluation norms

2.7.2. Indicators to assess knowledge, attitudes, skills (KAS)

- Assess the level of knowledge and skills: Knowledge and skills are determined through interview forms and checklists; Scored and total score calculated and divided into 3 levels as instructed below:

Percentage (points)	Explain
≥ 80% (total score):	Good/ Satisfactory
> 60% - < 80% (total score):	Average/unsatisfactory
≤ 60% (tổng số điểm):	Weak/ unsatisfactory.

2.9. Data analysis procedures

Data were entered using Epidata 3.1 software and processed using SPSS software 23.0 according to medical statistics method.

2.10. Control errors

Controlling errors is calculated right from the time the survey form is drawn up and edited accordingly before being sent to the investigation. The investigation research team is thoroughly trained, and the questionnaires are cleaned in the community.

2.11. Research ethic

The study has no impact on the health of study participants and has the effect of improving the health of people in the community. The research also contributes to improving the capacity of grassroots health workers. The study was approved by the Scientific Council, now the Medical Ethics Council, Thai Nguyen University of Medicine and Pharmacy before conducting the research.

Chapter 3.
RESEARCH RESULTS

3.1. Demographic characteristics and infertility prevalence of subjects

3.1.1. Demographic characteristics

Bảng 3.1. Table 3.1. Distribution by age group of research subjects

Age group	Wife's age		Husband's age	
	N	%	N	%
18 – 29	845	33,8	488	19,5
30 – 39	1109	44,4	1167	46,7
40 – 49	546	21,8	845	33,8
The average age	$33,3 \pm 7,3$		$36,4 \pm 11,2$	
Total	2500	100,0	2500	100,0

Comment: The average age of the wife was 33.3 ± 7.3 years. The average age of the husband was 36.4 ± 11.2 years

3.1.2. Prevalence of infertility

Table 3.4. Infertility rate in couples of reproductive age (n=2500)

Characteristic		N	%
Fertility		2404	96,2
Infertility		96	3,8
Classify	Primary	53	2,1
	Secondary	43	1,7

Gender	Male infertility	36	1,4
	Female infertility	60	2,4
Total		2500	100,0

Comment: The infertility rate among couples of childbearing age was 3.8% (96/2500 couples). Of these, primary infertility accounted for 2.1% and secondary infertility accounted for 1.7%.

Table 3.8. Distribution of history of infection in wives among infetility couples (n=96)

History of infection	N	%
Pelvic inflammatory disease	7	7.3
Vulvitis	21	21.9
Vaginitis	32	33.3
Cervicitis	15	15.6
STDs	4	4.2
Diabetes	16	16.7
Blocked fallopian tubes	10	10.4

Comment: Among infertile wives, 33.3% of wives had a history of vaginitis; 21.9% of wives had a history of vulvitis; 15.6% of wives had cervicitis; 16.7% of wives had a history of diabetes; 10.5% of wives have blocked fallopian tubes; 4.2% of wives have ever had an STD.

Table 3.9. Distribution of abnormal sperm history of husband among infetility couples (n=96)

Sperm abnormalities	Husband	
	SL	%
Husband is sterilized	first	1.0
Sperm abnormalities	26	27.1
No sperm	4	4.2
The percentage of motile sperm decreases	29	30.2
Sperm density decreases	25	26.0
The rate of viable sperm is low	25	26.0

Comment: Among infertile husbands, 27.1% of husbands had sperm abnormalities, 4.2% had no sperm; 30.2% of husbands had reduced

sperm mobility; 26% of husbands had reduced sperm density and 26.0% of husbands had low sperm survival rate.

Table 3.11. Distribution of infertility rate in the study population by age group

Age group		N	Number of Infertility	%
Wife's age	18 – 29	845	41	4.9
	30 – 39	1109	33	3.0
	40 – 49	546	22	4.0
Husband's age	18 – 29	488	29	5.9
	30 – 39	1167	42	3.6
	40 – 49	845	25	3.0
Total		2500	96	3.8

Comment: The rate of infertility in the 18 - 29 age group was highest in both husband and wife at 4.9% and 5.9% respectively. The lowest rate of infertility was in wives aged 30-39 (3.0%) and in husbands aged 40-49 (3.0%).

3.2. Analyze some factors related to infertility

3.2.2. Factors belong to the behavior of husband and wife

Table 3.17. The relationship between a wife's history of miscarriage and infertility

Miscarriage	Infertility		Fertility		Total (SL, %)	OR (95%CI)	p
	N	%	N	%			
Having a miscarriage	16	6,0	252	94,0	268(10,7)	1,71 (1,0-2,9)	<0,05
No miscarriage	80	3,6	2152	96,4	2232(89,3)		
Total	96	3,8	2404	96,2			

Comment: The number of miscarriages had a statistically significant association with female infertility (p < 0.05). The proportion of infertile people with a history of miscarriage was 6.0%,

higher than this rate in those without miscarriage (accounting for 3.6%).

Table 3.18. The relationship between history of ectopic pregnancy in the wife and infertility

Ectopic pregnancy	Infertility		Fertility		OR (95%CI)	p
	N	%	N	%		
Yes	6	14,6	35	85,4	4,51 (1,9-11,0)	<0,05
None	90	3,7	2369	96,3		
Total	96	3,8	2404	96,2		

Comment: History of ectopic pregnancy has a statistically significant association with infertility in women, p<0.05. The number of people with a history of ectopic pregnancy being infertile (14.6%) is higher than those without a history of ectopic pregnancy (3.7%).

Table 3.20. Relation between the wife's menstrual cycle characteristics and infertility

Exposure factors		Infertility		Fertility		OR (95%CI)	p
		N	%	N	%		
Amenorrhea	Yes	10	13.9	62	86.1	4,39 (2,18-8,86)	<0.05
	None	86	3.5	2342	96.6		
Menstrual cycle	Abnormal	32	8.9	328	91.1	3,16 (2,03-4,90)	<0.05
	Normal	64	3.0	2072	97.0		
Total		96	3.8	2404	96.2		

Comment: History of amenorrhea and menstrual cycle characteristics in the wife have a statistically significant association with female infertility (p<0.05). The proportion of people with a history of secondary amenorrhea who are infertile is 13.9%, higher than those without amenorrhea (3.5). The rate of people with a history of irregular menstruation being infertile is 8.9%, higher than those with regular menstruation (3.5).

3.2.3. Factors related to the role of primary HCPs

Table 3.23. The relationship between annual gynecological examination at the health station and infertility

Related factors		Infertility		Fertility		OR (95%CI)	p
		N	%	N	%		
Regular gynaecological examination	None	50	5.5	857	94.5	1,96 (1,3-2,95)	<0.05
	Yes	46	2.9	1543	97.1		
Total		96	3.8	2400	96.2		

Comment: There are a significant relationship between annual gynecological examination and infertile among couples of reproductive age (p<0.05).

3.3. Evaluating the effectiveness of interventions to improve initial examination skills and infertility prevention counseling for primary HCPs

3.3.2. Results of Intervention activity

Solution 1: Health education communication on infertility prevention: There have been 10,000 leaflets distributed to couples of childbearing age in 20 communes of Phu Binh district. There are 20 banners and slogans hung in 20 communes of Phu Binh district. There have been 200 radio news broadcasts in villages and hamlets of 20 communes of Phu Binh district. **Solution 2:** A training course to improve the capacity of infertility examination and counseling for primary HCPs was held for 3 days with the participation of 41/42 health staff in charge of the reproductive health care program of 20 provinces. communes and medical centers in Phu Binh district reached 97.6%.

3.3.3. Effective intervention to improve infertility examination and consultation capacity for primary HCPs

Table 3.36. Intervention effectiveness (IE) in improving general knowledge about infertility

Correct knowledge	Intervention group				p	Control group				p	IE
	Pre		Post			Pre		Post			
	N	%	N	%		N	%	N	%		
Definition of infertility	31	76.5	40	97.6	0.01	20	66.7	25	83.3	>0.05	2.7
Age reduces fertility in women	3	7.3	30	73.2	0.001	8	26.7	16	53.3	0.01	803.1
Age reduces fertility in men	2	4.9	31	75.6	0.001	3	10.0	7	23.3	>0.05	1428.1
Infertility can be treated	13	31.7	34	82.9	0.001	10	33.3	17	56,7	<0.05	91.2

Comment : After the intervention, the proportion of medical staff with correct knowledge of the definition of infertility increased statistically significantly to 96.7%, with intervention effectiveness (IE) reaching 2,7%. The proportion of HCPs with correct knowledge about the age of reduced fertility in women and men increased significantly to 73.2% and 75.6%, with IE reaching 803,1% and

1428,1%, respectively. The proportion of HCPs understanding that infertility can be cured after intervention increased to 82.9%, IE reaching 91,2%

Table 3.39. Intervention effectiveness in improving general knowledge about examination, consultation and treatment of infertility among primary HCPs

Knowledge		Pre		Post		p	Effect index (%)
		N	%	N	%		
Intervention group	Satisfied	1	2,4	35	85.4	*<0.001*	*85.0*
	Not satisfied	40	97.6	6	14.6		
Control group	Satisfied	2	6.7	9	30.0	*<0.05*	*25.0*
	Not satisfied	28	93.3	21	70.0		
Intervention effectiveness (%)							*60.0*

Comment: Before the intervention, the rate of general knowledge about examination, consultation and treatment of infertility among primary HCPs was still low, accounting for 2.4% and 6.7%. After the intervention, in the intervention group, the proportion of primary HCPs with knowledge at a level achieved after the intervention increased statistically significantly to 85.4% compared to before the intervention (2.4%), with the effect index 85%. The intervention's effectiveness in improving general knowledge about examination, consultation and treatment of infertility among primary HCPs reached 60.0%.

Table 3.41. Intervention effectiveness in improving the attitudes of primary HCPs in examining, detecting and counseling on infertility prevention

Attitude		Pre		Post		p	Effect index (%)
		N	%	N	%		
Intervention group	Positive	19	46.3	41	100	*<0.001*	115.9
	Negative	22	53.7	0	0		
Control group	Positive	7	23.3	9	30	*>0.05*	28.8
	Negative	23	76.7	21	70		
Intervention effectiveness (%)							87.1

Comment: After the intervention, in the intervention group, the proportion of health workers with a positive attitude in

examining, detecting and advising on infertility prevention at the primary level increased significantly to 100% compared to before the intervention (accounting for 46.3%), with effect index reaching 115.9%. The intervention's effectiveness in improving general attitudes about examination, counseling and treatment of infertility among primary HCPs reached 87.1%, $p < 0.001$.

Table 3.42. Intervention effectiveness improved examination skills of primary HCPs

Correct skills	Intervention group				p	Control group				p	IE
	Pre		Post			Pre		Post			
	N	%	N	%		N	%	N	%		
Exam of the external genitals	10	24.4	38	92.7	0.001	7	23.3	13	43.3	<0.05	194.1
Vulva exam	20	48.8	38	92.7	0,001	15	50.0	15	50.0	>0.05	89.9
Vaginal exam	14	34.1	37	90.2	0.001	11	36.7	14	46.7	>0.05	137.3
Check the condition of the cervix	11	26.8	39	95.1	0.001	9	30.0	12	40.0	>0.05	221.5
Examine the left adnexa	12	29.3	37	90.2	0.001	11	36.7	14	46.7	>0.05	180.6
Examine the right adnexa	13	31.7	37	90.2	0.001	10	33.3	16	53.3	<0.05	124.4

Comment: After intervention, correct skills in examining the genitals and vulva increased to 92.7%; Vaginal examination and adnexal examination increased to 90.2%; Cervical examination increased to 95%, (p<0.001). The highest intervention effectiveness was 221,5%. At post-intervention, the majority of examination skills of HCPs in the control group did not much improved compared to pre-intervention time (p>0.05).

Table 3.60. Intervention effectiveness in improving general skills in examination, consultation and treatment of infertility

Skill		Pre-intervention		Post-intervention		p	Effect index (%)
		N	%	N	%		
Intervention group	Satisfied	6	14.6	39	95.1	*<0.001*	551.4
	Not satisfied	35	85.4	2	4.9		

Control group	Satisfied	1	3.3	5	16.7	>0.05	13.9
	Not satisfied	29	96.7	25	83.3		
Intervention effectiveness (%)							537.5

Comment: After intervention, in the intervention group, tThe percentage of primary HCPs with skills at a satisfactory level after the intervention increased statistically significantly to 95.1% compared to before the intervention (14.6%), with the effect index reaching 551.4%. The effectiveness of the intervention in improving general skills in examination, consultation and treatment of infertility of primary HCPs reached 537.5%

Box 3.5. Intervention effectiveness in Phu Binh District

"...In my opinion, intervention activities to improve the capacity of infertility examination and consultation for commune-level health workers in our district have achieved certain results. According to the report, infertility examination and counseling programs are implemented more and more frequently in communes. I personally highly appreciate the effectiveness of this program. This activity should be replicated and maintained because it is quite easy to organize and costs little money..."

Leader of Phu Binh District Health Center

"Since receiving the training, my midwife and I have also seen our ability to examine, detect and treat diseases that cause infertility have improved significantly. After the examination, we also spend more time consulting them. I examined and consulted enthusiastically, so people trusted me and came for more examinations. Then one person passed it on to the other, so more people came for examination. We also see ourselves as having a more important role and responsibility in preventing infertility for people....

Head of Thanh Ninh commune health station - Phu Binh

Chapter 4.
DISCUSSION

4.1. Describe the prevalence of infertility among couples of reproductive age in Thai Nguyen province in 2018.

4.1.1. Demographic characteristics of couples of reproductive age

* Age characteristics

The research results showed that the majority of couples participating in the study were in the age group 30-39 years old, accounting for 44.4% and 46.7%. The average age of the wife is 33.3 ± 7.3 years old, husband's age is 36.4 ± 11.2. At this age, the wife's fertility begins to decline. In research of Do Thi Kim Ngoc in Can Tho, the average age of the wife was 34.4 ± 7.5, which is within the childbearing age range, of which the age group 30-39 accounted for the highest proportion, 43.9%. The husband's average age is 37.7±7.6, within the childbearing age range, with the highest being >30 years old (62.9%), followed by >40 years old (38.1%).

4.1.2. Prevalence of infertility among couples of reproductive age in Thai Nguyen province in 2018

4.1.2.1. Prevalence of infertility

Research results show that the infertility rate among couples of childbearing age is 3.8% (96/2500 couples). This result shows that out of every 1,000 couples, there are up to 38 couples who are infertile. Infertility has a negative impact on the health and life of individuals through manifestations of depression, anxiety, stress, frustration, sexual dysfunction, and social stigma. In addition, infertility creates high economic burdens for couples and can lead to domestic violence, divorce... Therefore, the above infertility rate is an remarkable situation for couples in childbearing age in Vietnam.

Despite this, infertility rates with 3.8% in our study is somewhat lower than in some other studies in Vietnam and around the world. This may be because the research area is Thai Nguyen, a province in the Northern mountainous region that is still developing. Therefore, there are few facilities that can accurately diagnose infertility. Besides, the majority of couples in the study were in rural and mountainous areas far from infertility treatment facilities.

Research results by Do Thi Kim Ngoc in Can Tho City showed that the general infertility rate of Can Tho city in 2009 was 5.6%, of which primary infertility was 2.5%, secondary infertility was 3.1% in the community. In infertility, the rate of primary infertility was 44.6%, secondary was 55.5% higher. Author Kim N.I and colleagues in a 2021 review study on infertility pointed out that the overall rate of infertility in married women between the ages of 20 and 44 was 5.0%, of which the rate was 5.0%. Primary and secondary infertility rates were 1.4% and 3.6%, respectively. According to research by

Nguyen Viet Tien and colleagues (2010), the infertility rate in Vietnam was on average 7.7%. Of these, the rate of primary infertility was 3.9% and secondary infertility is 3.8%.

4.1.2.2. Disease distribution characteristics

* Characteristics of disease distribution by age group

Research results show that the distribution of infertility rates is highest in the age group 18 - 29 for both husband and wife with rates of 4.9% and 5.9% respectively. This result shows that infertility cases detected in the community tend to be concentrated in young people under 30 years old. This is a common age for marriage in Vietnam. Do Thi Kim Ngoc in Can Tho pointed out that the infertility rate in wives aged 15-29 is highest (7%), 1.63 times higher than the 40-49 years old group (4.4%), followed by the 30-39 years old group (5.4%). 1.24 times compared to group 40-49, not statistically significant p>0.05.

* Infertility distribution according to wife's obstetric history

Some problems due to abnormalities in the fallopian tubes or uterus can prevent the egg from implanting or increase the risk of miscarriage or ectopic pregnancy, such as uterine polyps or uterine fibroids. uterus, fallopian tube blockage, uterine deformities, cervical stenosis or adhesions... can all be causes of infertility. Our research results were similar to the research results of some previous authors. According to research results by Do Thi Kim Ngoc in 2018, the infertility rate in the group with a history of miscarriage (7.2%) was 1.38 times higher than the group without this history, with p>0.05. The group with history of abortion (1.9%) was lower than the group without abortion (7.1%) with p=0.01.

* Infertility distribution according to husband's abnormal factors

The results showed that infertile husbands often have sperm abnormalities such as reduced sperm motility rate, decreased sperm density, and low viable sperm rate. According to research results by Le The Vu and colleagues, the cause of male infertility due to semen abnormalities accounts for the highest rate of 85.5%, of which azoospermia accounts for 50%.

4.2. Analysis of some related factors of infertility in research subjects

4.2.1. Factors related to the behavior of husbands and wives

* Factors related to the obstetric history of the infertile wife

Research results show that the number of miscarriages and history of ectopic pregnancy in the wife are related to infertility.The proportion of infertile people with a history of miscarriage was 6.0%, higher than this rate in those without miscarriage (accounting for 3.6%).The number of people with a history of ectopic pregnancy being infertile (14.6%) was higher than those without a history of ectopic pregnancy (3.7%). History of childbirth, such as infected birth, miscarriage, abortion... leading to complications of postpartum infection and bleeding are the leading causes of secondary infertility .Do Thi Kim Ngoc's research also showed that the infertility rate in the group with a history of miscarriage (7.2%) was 1.38 times higher than the group without this history, with p>0.05.

* Factors of menstrual cycle

Our research results showed that, history of amenorrhea and menstrual cycle characteristics in the wife have a statistically significant association with female infertility (p<0.05). Women with regular menstruation are likely to have normal functioning of the hypothalamic-pituitary-ovarian axis, so they often ovulate and have good fertility. On the contrary, irregular menstruation, the possibility of difficulty ovulating during menstruation, is the cause of infertility. Tran Dac Nguyen and colleagues pointed out that the rate of primary infertility in the group with irregular menstrual cycles was higher than the group with regular menstrual cycles, the corresponding rate was 82% compared to 63.4% (OR= 2.6; 95% CI: 1.02 – 6.81; p=0.04).

4.2.2. Related factors belong to the role of primary HCPs

Research results show that people who have access to information about infertility prevention and receive advice about infertility from

HCPs at health stations have lower rates of infertility than those who do not have access information and not advice. However, the effect of this on infertility is not clear. Research results show that annual gynecological examinations are related to infertility.This result demonstrated the important role of early detection and examination and treatment of diseases that can cause infertility at the primary level in preventing infertility. Therefore, improving consulting capacity and infertility prevention examination and treatment capacity for primary HCPs was essential in improving the rate of infertility in the community.

4.3. Evaluate the capacity and effectiveness of intervention solutions to improve consultation and initial examination of infertility of primary HCPs.

4.3.2. Effective solution to improve infertility examination and consultation competence for primary HCPs

* Effective intervention to improve knowledge of infertility examination and counseling for primary HCPs

Research results show that the intervention solution helps significantly improve knowledge about infertility examination and counseling for primary HCPs. After the intervention, in the intervention group, the proportion of primary HCPs with knowledge at a level achieved after the intervention increased significantly to 85.4% compared to before the intervention (2.4%), with effect index achieving 85%. The intervention's effectiveness in improving general knowledge about examination, consultation and treatment of infertility among primary HCPs reached 60.0%.

The above results show that the training solution to improve the capacity of infertility examination and counseling has been effective in improving knowledge for primary HCPs. During the training sessions, we focus on basic knowledge about infertility and infertility treatment methods. This research result is consistent with the results of the study by author Khadivzadeh T and colleagues in 2021, in

Iran.

* Intervention effectiveness in improving infertility examination and counseling attitudes for primary HCPs.

Research results show that the intervention helps improve attitudes about infertility examination and counseling for primary HCPs. Specifically, after the intervention, in the intervention group, the proportion of health workers with a positive attitude in examining, detecting and advising on infertility prevention at the primary level increased significantly to 100% compared to before the intervention (accounting for 46.3%), with effect index reaching 115.9%. Improving the attitudes in examining and consulting infertility of primary HCPs helps increase staff confidence in diagnosing and treating diseases in general and diseases causing infertility in particular. In addition, recognizing the importance of infertility consultation and treatment at the primary level will cause medical staff to spend a lot of time on infertility counseling for couples who come for examination at the clinic. In addition, to provide medical examination and treatment at the grassroots level, medical staff need to regularly update and improve their professional skills to meet the requirements of medical examination and treatment. This will have a great impact on infertility prevention for couples in the areas they manage.

A controlled before-and-after intervention study was conducted on 108 medical staff in Iran. The results show a change in the attitude of medical staff in infertility counseling. Before the intervention, the attitude scores of the two intervention groups in the form of group discussion and webinar were 165.8 ± 19.3 and 161.0 ± 23.2, with no difference compared to the average attitude score in the group. control 172.4 ± 15.2, $p = 0.05$. After the intervention, the average attitude scores of the two intervention groups increased to 192.0 ± 16.0 and 196.5 ± 14.1, respectively, significantly higher than the

control group (176.1 ± 16.1).) and compared to the average score before intervention, with p < 0.001.

* Effectively improving infertility examination and counseling skills of primary HCPs

Research results show that the intervention solution not only improves the knowledge and attitudes of primary HCPs but also enhances their infertility examination and counseling skills. The above results are due to the fact that in intervention activities, we focused on training research subjects in consulting and medical examination and treatment skills. Specifically, the contents include: Consulting on prevention and timely detection of genital infections: Postpartum inflammation - postpartum infection, abortion, inflammation due to contraceptive equipment use, or infectious diseases sexually…; Gynecological examination, detection, treatment and monitoring of genital inflammation cases; Ultrasound, detection and treatment advice for cases of gynecological diseases related to infertility. Treatment of common infections (such as lower genital inflammation caused by bacteria). Instructions on how to recognize the signs of ovulation and calculate the day of ovulation...; Consulting and guidance on choosing a suitable place for infertility examination and treatment.

To increase the effectiveness of training and appropriate guidance for subjects during implementation, the research team has developed training content and direct guidance using role-playing method for research subjects.

4.4. Feasibility and sustainability of the intervention solution

In Vietnam in general and Thai Nguyen, there are not many large-scale intervention programs to improve the capacity of medical examination and treatment and infertility counseling for specialized primary HCPs. The main activity of the program is training to improve the capacity of infertility examination and counseling for specialized primary HCPs with the conditions of resources and facilities and equipment at the primary level.

4.5. The limitation of dissertation

Cross-sectional research has not shown the development trend of infertility in Thai Nguyen province. It needs to be described longitudinally in future studies to clearly see the rate. Prevalence and incidence of infertility among couples of reproductive age.

CONCLUSION

1. Prevalence of infertility among couples of reproductive age in Thai Nguyen province in 2018.

-The infertility rate among couples of reproductive age was 3.8% (96/2500 couples). Of which primary infertility accounts for 2.1% and secondary infertility accounts for 1.7%.

- Among infertile wives, 16.7% had a history of miscarriage, 6.3% of wives had a history of ectopic pregnancy, and 4.2% of wives had inflammatory complications after miscarriage.

- The rate of infertility in the age group 18 – 29 was highest in both husband and wife at 4.9% and 5.9% respectively.

- The infertility rate in both wives (4.3%) and husbands (4.2%) who work as freelancers was higher than in other occupational groups.

2. Some related factors of infertility in research subjects

Some related factors of infertility has been identified as follows:

- BMI has a statistically significant association with female infertility ($p < 0.05$).

- History of miscarriage has a statistically significant association with female infertility ($p < 0.05$).

- History of ectopic pregnancy is associated with infertility rate ($p < 0.05$).

- History of amenorrhea and menstrual cycle characteristics in the wife have a statistically significant association with female infertility ($p < 0.05$).

- There are a significant relationship between annual gynecological examination and infertile among couples of reproductive age (p<0.05).

3. The effectiveness of intervention solutions to improve consultation and initial examination of infertility of primary HCPs.

- The rate of general knowledge about examination, consultation and treatment of infertility among primary HCPs in Phu Binh district, Vo Nhai district and both districts was still low, accounting for 4.2%.

- Percentage of primary HCPs with positive attitudes in examining, detecting and consulting on infertility prevention was 46.3% in Phu Binh district and 23.3% in Vo Nhai district.

- The proportion of HCPs with satisfied skills in infertility examination, treatment and counseling at a satisfactory level was 14.6% in Phu Binh district and 3.3% in Vo Nhai.

- After the intervention, in the intervention group at Phu Binh district, the proportion of primary HCPs with satisfied knowledge after the intervention increased statistically significantly to 85.4% compared to before the intervention (2.4%). The intervention's effectiveness in improving general knowledge about examination, consultation and treatment of infertility among primary HCPs reached 60.0%.

- After the intervention, in the intervention group at Phu Binh district, the proportion of HCPs with a positive attitude in examining, detecting and advising on infertility prevention at the primary level increased significantly to 100% compared to before the intervention (accounting for 46.3%), with effect index reaching 115.9%. The intervention's effectiveness in improving general attitudes about examination, counseling and treatment of infertility among primary HCPs reached 87.1%.

In the intervention group at Phu Binh district, the percentage of primary HCPs with satisfied skills at after the intervention increased statistically significantly to 95.1% compared to before the

intervention (14.6%), with the effect index reaching 551.4%. The effectiveness of the intervention in improving general skills in examination, consultation and treatment of infertility of primary HCPs reached 537.5%.

   - Ability to maintain favorable and feasible intervention solutions because of their ease, reasonableness and low cost.

RECOMMENDATION

To reduce the infertility rate, it is necessary to implement some following solutions:

Thai Nguyen Department of Health, Phu Binh and Vo Nhai District Health Centers need to support and strengthen training to improve capacity in primary medical examination and treatment and infertility counseling for commune and ward HCPs. Strengthen monitoring activities in the implementation of medical examination and treatment and infertility counseling in the community.

Primary HCPs in Thai Nguyen province need to apply and implement intervention solutions that have been trained to achieve high efficiency in reducing the infertility rate for couples of reproductive age in the community.

Promote community-based couselling activities to raise awareness of infertility, including causes, prevention, and information on support services which is available at primary health care systems.