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# ARTICLE

## CHARACTERISTICS OF HYSTEROSALPHINGOGRAPHY FINDINGS IN INFERTILE PATIENTS AT PROF DR. I.G.N.G NGOERAH CENTRAL HOSPITAL AT PERIODE OF JANUARY 2021 TO JUNE 2024

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## ABSTRAK

Infertility is the inability to achieve pregnancy after 12 months of regular unprotected intercourse, affecting millions globally. In Indonesia, it affects 10-15% of reproductive-aged couples. Infertility can be classified as primary (no prior pregnancies) or secondary (previous pregnancies). HSG is commonly used to assess uterine and tubal abnormalities, key contributors to infertility. Descriptive qualitative study are done to examine correlation of age, uterine abnormalities, and fallopian tube abnormalities from HSG findings with the prevalence of infertility from patients in Radiology Department from Prof. Dr. I.G.N.G. Ngoerah Central General Hospital, covering the period from January 2021 to June 2024. 66 patients were collected as samples. 47 patients (71.21%) have primary infertility, while 19 patients (28.79%) have secondary infertility. 9 patients (13.63%) have uterus abnormalities, while 21 patients (31.81%) have fallopian tube abnormalities. Hysterosalpingography (HSG) is a key diagnostic tool in evaluating infertile patients, providing insights into uterine and fallopian tube morphology and patency. It detects structural abnormalities like retroflexed uterus, didelphys, or blocked tubes, which can hinder sperm-egg interaction, embryo implantation, or cause recurrent miscarriages, affecting fertility.

**Keywords:** Abnormalities; Fallopian tube; Hysterosalphyngography; Infertiliy, uterus

## АБСТРАКТ

Бесплодие - это неспособность достичь беременности после 12 месяцев регулярных незащищенных половых контактов, от которой страдают миллионы людей во всем мире. В Индонезии оно затрагивает 10-15 % пар репродуктивного возраста. Бесплодие может быть классифицировано как первичное (отсутствие предыдущих беременностей) или вторичное (предыдущие беременности). ГСГ обычно используется для оценки аномалий матки и труб, которые являются основными причинами бесплодия. Описательное качественное исследование было проведено с целью изучения корреляции возраста, аномалий матки и маточных труб по результатам ГСГ с распространенностью бесплодия у пациенток радиологического отделения Центральной больницы им. профессора д-ра И.Г.Н.Г. Нгоераха за период с января 2021 по июнь 2024 года. В качестве образцов было отобрано 66 пациентов. У 47 пациенток (71,21%) было первичное бесплодие, у 19 пациенток (28,79%) - вторичное бесплодие. У 9 пациенток (13,63%) выявлены аномалии матки, у 21 пациентки (31,81%) - аномалии фаллопиевых труб. Гистеросальпингография (ГСГ) является ключевым диагностическим инструментом при обследовании бесплодных пациенток, позволяющим получить представление о морфологии и проходимости матки и фаллопиевых труб. Она позволяет выявить такие структурные аномалии, как ретрофлексия матки, дидельфис или закупорка труб, которые могут препятствовать взаимодействию сперматозоида и яйцеклетки, имплантации эмбриона или вызывать повторяющиеся выкидыши, влияя на фертильность.

**Ключевые слова:** Аномалии; фаллопиева труба; гистеросальпингография; бесплодие, матка

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## INTRODUCTION

Infertility is a disease of the male or female reproductive system characterized by the failure to achieve pregnancy after 12 months or more of regular unprotected sexual intercourse. Infertility affects millions of reproductive-aged individuals worldwide and has significant impacts on families and communities. Globally, approximately 48 million couples and 186 million individuals live with infertility, with one in six individuals experiencing infertility.[19,20] In Indonesia, the prevalence of infertility is around 10-15%, or 4-6 million couples out of 39.8 million couples of reproductive age.[15] The causes of infertility can originate from either the female or male partner, with each accounting for 35% of cases, while the remaining 30% is attributed to combined factors or unknown causes.[8]

In the male reproductive system, infertility may be caused by blockages in the reproductive tract leading to dysfunctional semen ejaculation, hormonal disturbances affecting the production of hormones by the pituitary gland, hypothalamus, and testes. Failure from testicles origin might be caused by failure of the testes to produce sperm, or abnormal sperm function and quality. In the female reproductive system, infertility can result from abnormalities in the ovaries, fallopian tubes, or uterus, as well as endocrine disorders causing reproductive hormone imbalances.[19] Infertility can be classified as primary or secondary. Primary infertility refers to cases where an individual has never achieved pregnancy, whereas secondary infertility refers to instances where at least one prior pregnancy has been achieved.[20]

The management of infertility includes prevention, diagnosis, and treatment. Diagnosis can be established through a thorough medical history, physical examination, and additional diagnostic procedures such as imaging, including ultrasonography (USG), hystero-salpingography (HSG), and magnetic resonance imaging (MRI).[14] Hystero-salpingography (HSG) is the most commonly used radiographic diagnostic modality, particularly for assessing the uterus and fallopian tubes. Uterine abnormalities are considered causative factors in approximately 10% of infertile women and in 50% of women with recurrent miscarriages, while the prevalence of tubal abnormalities in infertility is around 20%. These data emphasize the importance of assessing the uterus and fallopian tubes as part of the standard initial evaluation of infertility.[7,16]

Based on these findings, this study is conducted with the aim of collecting data on abnormalities found through HSG examination at Prof. Dr. I.G.N.G Ngoerah Central Hospital.

## MATERIAL AND METHODS

We conducted a descriptive qualitative study to examine the correlation between age, uterine abnormalities, and fallopian tube abnormalities from HSG findings with the prevalence of infertility. We utilized data from patients who underwent HSG at the Radiology Department of Prof. Dr. I.G.N.G. Ngoerah Central General Hospital, covering the period from January 2021 to June 2024. The inclusion criteria were patients who presented for hysterosalpingography at the Radiology Department during the study period and who consented to participate in the study after receiving informed consent from the research team. The exclusion criteria were patients who were unwilling or declined to sign the informed consent, thereby excluding them from the sample. Descriptive data of the patients will be compiled according to age, infertility status, uterus morphology, fallopian tube's patency, uterus abnormality, and fallopian tube's abnormality. From these datas, we compiled the data of bivariate descriptive data for age to infertility, uterus abnormalities to infertility, and fallopian tube's abnormality to infertility.

The study protocol and all amendments were reviewed and approved by the independent ethics committee or institutional review board at each site..

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## RESULT

From all the data we have already compiled, we can find there are 66 patients. Subjects Distribution According to Age. Based on the results of the research and data analysis conducted, the age variable was categorized into three groups: respondents aged 20-30 years, 31-40 years, and ≥41 years. The analysis results can be seen in the table below. (Table 1)

**Table 1.** Subjects' Distribution according to Age

| No | Age | Absolute | % |
|---|---|---|---|
| 1 | 20-30 | 32 | 48.48 |
| 2 | 31-40 | 29 | 43.94 |
| 3 | ≥41 | 5 | 7.58 |
| Total | | 66 | 100 |

Subjects Distribution According to Infertility, additionally the infertility variable was categorized into two groups: respondents with primary infertility and secondary infertility. The analysis results can be seen in the table below.

**Table 2.** Subjects' Distribution according to Infertility

| No | Infertility | Absolute | % |
|---|---|---|---|
| 1 | Primary | 47 | 71.21 |
| 2 | Secondary | 19 | 28.79 |
| Total | | 66 | 100 |

Subjects Distribution According to Uterus Morphology. Next we categorized the uterus morphology into anteflexion abnormality and retroflexed abnormality

**Table 3**. Subjects' Distribution according to Uterus Morphology

| No | Infertility | Absolute | % |
|---|---|---|---|
| 1 | Anteflexed | 41 | 62.12 |
| 2 | Retroflexed | 25 | 37.88 |
| Total | | 66 | 100 |

Subjects Distribution According to Fallopian Tube's Patency. The next group we categorized patient based on the fallopian tube's patency. We divided the patency into bilateral tube patency, bilateral non-patent tube, and unilateral non-patent tube. (Table 4)

Subjects Distribution According to Uterus Abnormalities. We categorized patients based on the uterus abnormalities. From 66 patients, there were 9 patients who have uterus abnormalities (13.66%) that consist of didelphys uterus, bicornuate uterine, arcuate uterus, leiomyoma uterus, adenomiosis, endometritis and synechia. (Table 5).

Subjects Distribution According to Fallopian tube's abnormality. We categorized patients based on fallopian tube abnormality. From 66 patients, there were 21 patients who have abnormality to the fallopian tube (13.82%) that consist of salpingitis bilateral, salpingitis unilateral, hydrosalphinx bilateral, hydrosalphinx unilateral and agenesis tube unilateral. (Table 6). There is a descriptive link between age and infertility that is bivariate. In order to obtain a descriptive bivariate distribution of age and infertility, we classified patients using a cross table.

The age range was broken down into three categories: those between the ages of 20 and 30 years old, those between 31 and 40 years old, and those who were 41 years old or beyond. According to our classification, there are two types of infertility: primary infertility and secondary infertility. Table 7. In order to have a better understanding of the bivariate distribution of uterine anomalies and infertility, we categorized patients into a cross table.

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This was done in order to ascertain the bivariate descriptive connection that exists between anomalies of the uterus and infertility. According to our classification, there are two types of infertility: primary infertility and secondary infertility. The table 8 . In order to acquire a descriptive bivariate distribution of fallopian tube anomalies and infertility conditions, we grouped patients into cross-tabulations.

This was done with the purpose of acquiring the information that was desired. This was done so that we could discover the bivariate descriptive association that exists between fallopian tube defects and infertility. Because of this, we were able to determine the existence of this association. Primary infertility and secondary infertility are two separate types of infertility, each of which possesses its own set of distinctive traits. Infertility is a condition that may be divided down into two distinct groups. Please refer to Table 9 for further information.

**Table 4.** Subjects' Distribution according to Fallopian Tube's Patency

| No | Fallopian Tube's patency | Absolute | % |
|---|---|---|---|
| 1 | Patent bilateral tube | 37 | 56.06 |
| | Bilateral obstruction | 3 | 4.54 |
| | Unilateral obstruction | 2 | 3.03 |
| 2 | Non-patent bilateral tube | 8 | 12.12 |
| | Bilateral total tube obstruction | 1 | 1.52 |
| 3 | Unilateral non patent tube | 14 | 21.21 |
| | Unilateral total tube obstruction | 1 | 1.52 |
| | Total | 66 | 100 |

**Table 5.** Subjects' Distribution according to Uterus' abnormalities

| No | Uterus Abnormalities | Absolute | % |
|---|---|---|---|
| 1 | Didelphys uterys | 1 | 1.52 |
| 2 | Bicornuate uterine | 1 | 1.52 |
| 3 | Arcuate uterus | 2 | 3.03 |
| 4 | Leiomyoma uterus | 1 | 1.52 |
| 5 | Adenomiosis | 1 | 1.52 |
| 6 | Endometritis | 2 | 3.03 |
| 7 | Synechia | 1 | 1.52 |
| | Total | 9 | 13.66 |

**Table 6.** Subjects' Distribution according to Fallopian Tube's Abnormalities

| No | Fallopian tube's abnormalities | Absolute | % |
|---|---|---|---|
| 1 | Bilateral salpyingitis | 3 | 4.54 |
| 2 | Unilateral salpyngitis | 4 | 6.06 |
| 3 | Bilateral hydrosalphinx | 8 | 12.12 |
| 4 | Unilateral hydrosalphinx | 5 | 7.58 |
| 5 | Unilateral tube agenesis | 1 | 1.52 |
| | Total | 21 | 31.82 |

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**Table 7**. Subjects' Bivariate Distribution according to Age Categories and Infertilites

| No | Age | Infertility | Absolute | % |
|---|---|---|---|---|
| 1 | 20-30 | Primary | 29 | 43.94 |
| | | Secondary | 3 | 4.55 |
| 2 | 31-40 | Primary | 16 | 24.24 |
| | | Secondary | 12 | 18.18 |
| 3 | ≥41 | Primary | 2 | 3.03 |
| | | Secondary | 4 | 6.06 |
| Total | | | 66 | 100 |

**Table 8.** Subjects' Bivariate Distribution according to Uterus Abnormalities and Infertilites

| No | Uterus Abnormalities | Infertility | Absolute | % |
|---|---|---|---|---|
| 1 | Didelphys uterus | Primary | 1 | 1.52 |
| | | Secondary | - | |
| 2 | Bicornuate uterine | Primary | 1 | 1.52 |
| | | Secondary | - | |
| 3 | Arcuate uterus | Primary | 2 | 3.03 |
| | | Secondary | - | |
| 4 | Leiomyoma uterus | Primary | 1 | 1.52 |
| | | Secondary | - | |
| 5 | Adenomiosis | Primary | 1 | 1.52 |
| | | Secondary | - | |
| 6 | Endometritis | Primary | 2 | 3.03 |
| | | Secondary | - | |
| 7 | Synechia | Primary | - | |
| | | Secondary | 1 | 1.52 |
| Total | | | 9 | 13.66 |

**Table 9.** Subjects' Bivariate Distribution according to Fallopian tube's Abnormalities and Infertilites

| No | Fallopian Tube Abnormalities | Infertility | Absolute | % |
|---|---|---|---|---|
| 1 | Bilateral salpyingitis | Primary | 3 | 4.54 |
| | | Secondary | - | |
| 2 | Unilateral salpyngitis | Primary | 4 | 6.06 |
| | | Secondary | - | |
| 3 | Bilateral hydrosalphinx | Primary | 8 | 12.12 |
| | | Secondary | - | |
| 4 | Unilateral hydrosalphinx | Primary | 4 | 6.06 |
| | | Secondary | 1 | 1.52 |
| 5 | Unilateral tube agenesis | Primary | 1 | 1.52 |
| | | Secondary | - | |
| Total | | | 21 | 31.82 |

**Table 10.** Subjects' Bivariate Distribution according to Fallopian tube's Abnormalities and Infertilites

| No | Infertility | Fallopian tube patency | Absolute | % |
|---|---|---|---|---|
| 1 | Primary | Bilateral patent tubes | 26 | 39.39 |
| | | Unilateral non patent tube | 12 | 18.18 |
| | | Bilateral non patent tubes | 9 | 13.64 |
| 2 | Secondary | Bilateral patent tubes | 11 | 16.66 |
| | | Unilateral non patent tube | 7 | 10.61 |
| | | Bilateral non patent tubes | 1 | 1.52 |
| Total | | | 66 | 100 |

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## DISCUSSION

This study provides important insights into the abnormalities detected through hysterosalpingography (HSG) in infertile patients at RSUP Prof. Dr. I.G.N.G Ngoerah during the period from January 2021 to June 2024. Through the analysis of age distribution, type of infertility, and abnormalities in the uterus and fallopian tubes, the findings emphasize that various anatomical and functional factors contribute to patients' difficulties in achieving pregnancy. The discussion will be structured into several sub-sections to facilitate a better understanding of the clinical aspects and the relevance of these findings to infertility management.

The study results show that the majority of respondents who underwent HSG were in the 20-30 age group (48.48%), followed by the 31-40 age group (43.94%), with only a small percentage over 41 years old (7.58%). This indicates that awareness of infertility evaluation is higher among younger patients. Age is one of the critical factors in female fertility. As age increases, the quality and quantity of oocytes (eggs) decline, leading to a reduced ability to conceive, particularly after the age of 35.[7] Younger women tend to have better reproductive prospects and are more likely to seek immediate evaluation and treatment for infertility compared to older women, whose reproductive function naturally declines.

It is also important to note that the age of the patient is closely related to the type of infertility that is being treated. Patients in the younger age group were more likely to be diagnosed with primary infertility, whereas patients in the older age groups were more likely to be diagnosed with secondary infertility. In accordance with the literature, which asserts that age has a key role in sustaining fertility, particularly after having given birth to a child, this is compatible with the findings. A decline in the quality of the oocytes, physical changes in the reproductive organs, or hormonal factors connected to age are frequently the causes of secondary infertility, which is characterized by the inability to conceive a second or subsequent pregnancy successfully.[11]

The findings show that primary infertility predominated among the respondents, with a prevalence of 71.21%, while secondary infertility accounted for only 28.79%. Primary infertility occurs in women who have never achieved pregnancy, while secondary infertility affects women who have previously conceived but are having difficulty becoming pregnant again. The causes of primary infertility generally involve congenital or anatomical abnormalities that obstruct the reproductive tract, such as cases of uterus didelphys or bicornuate uterus, both of which were identified in this study (1.52%). These abnormalities can hinder a woman's ability to achieve her first pregnancy.[5]


**Figure 1**. Didelphys Uterus (A): Plain radiograph showing a normal anatomical appearance. (B): Contrast medium fills the right uterine cavity smoothly, with backflow of contrast into the vagina. (C): The uterine cavity is in a retroflexed position, showing contrast filling the cervical canal, left uterine cavity, and left isthmus. (D): No contrast flow is seen towards the right fallopian tube.

In contrast, secondary infertility is often associated with conditions such as infections, systemic diseases, or changes in reproductive organs that occur after a previous pregnancy. Uterine abnormalities like synechiae, which are adhesions or scar tissue within the uterus caused by infections or previous medical procedures, can lead to secondary infertility.

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Synechiae were found in 1.52% of the patients in this study. This condition interferes with embryo implantation in the uterus, reducing the chances of a second pregnancy.[10]

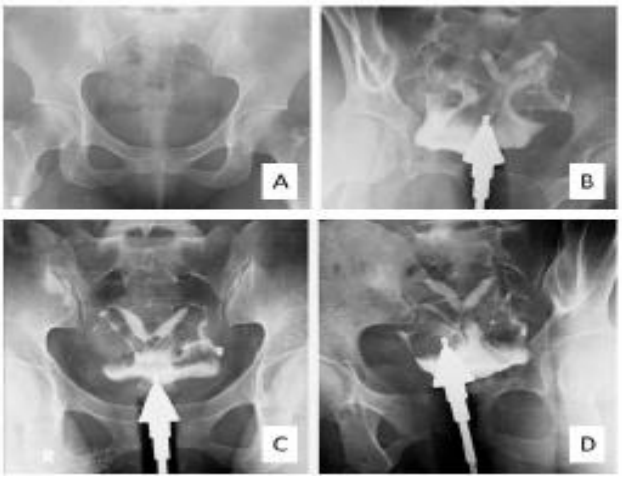


**Figure 2**. Bicornuate Uterus (A): Plain radiograph. (B): Contrast fills the cervical canal and uterine cavity, which is divided into two symmetric right and left parts, with smooth mucosal lining, and no persistent filling defects or additional shadows. (C): Contrast is seen filling both the right isthmus (continuous with the right uterine cavity) and the left isthmus (continuous with the left uterine cavity). (D): Contrast fills both fallopian tubes, with spillage (+) from both tubes.

The study also found that the majority of patients had an anteflexed uterus (62.12%), which is the normal uterine position. However, 37.88% of patients exhibited a retroflexed uterus, where the uterus is tilted backward. Although a retroflexed uterus is not a direct cause of infertility, some studies suggest that this position may hinder sperm travel to the fallopian tubes, potentially delaying fertilization.[4] However, there is no strong clinical evidence that retroflexed uterus directly causes infertility. Uterine abnormalities found in this study, such as uterus didelphys and bicornuate uterus (both 1.52%), can significantly affect fertility. Uterus didelphys is a condition where there are two separate uterine cavities, which can disrupt fetal development, lead to recurrent miscarriages, or cause difficulties in maintaining a pregnancy. Similarly, a bicornuate uterus, an abnormal uterine shape, can interfere with embryo implantation or result in miscarriage due to the abnormal uterine structure.[21]

Other abnormalities identified include leiomyomas (fibroids), adenomyosis, and endometritis, with a prevalence ranging from 1.52% to 3.03%. Leiomyomas, or uterine fibroids, are benign tumors that grow within the uterine muscle, and their impact on fertility depends on their size and location. Fibroids growing within the uterine cavity can block implantation or cause menstrual irregularities.[22] Adenomyosis, a condition in which the endometrial tissue grows into the uterine muscle wall, often results in painful menstruation and can negatively affect the ability to conceive.[10]

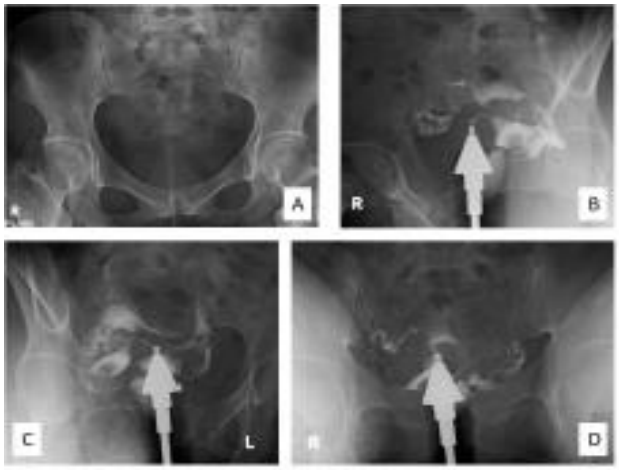


**Figure 3**. Leiomyoma uterine (A): Plain radiograph. (B), (C), (D): Contrast fills the uterine cavity, both fallopian tubes, with right and left peritoneal spillage. The cervical canal appears normal with regular margins. The uterine cavity is in a retroflexed position, with a rounded filling defect on the anterior uterine body, characterized by well-defined, smooth edges.

Patent fallopian tubes are essential for fertilization, as the oocyte must travel through the fallopian tube to meet the sperm. The study results indicate that the majority of patients (56.06%) had bilaterally patent fallopian tubes. However, 12.12% of patients had bilateral non-patent tubes, meaning both fallopian tubes were completely obstructed, and 21.21% had unilateral non-patency, where

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one tube was blocked. Fallopian tube obstruction can result from various factors, including previous infections such as salpingitis (fallopian tube inflammation), which was found in 4.54% of patients with bilateral obstruction and 3.03% with unilateral obstruction. Infections in the fallopian tubes can damage their structure and function, blocking the passage of sperm and oocytes.[9] Additionally, hydrosalpinx, a condition where the fallopian tube fills with serous fluid, was found in 12.12% of patients with bilateral conditions and 7.58% with unilateral conditions. This fluid can damage a fertilized embryo before it reaches the uterus, reducing the chances of pregnancy.[22] Managing blocked fallopian tubes may involve tubal reconstruction or assisted reproductive technologies (ART) such as in vitro fertilization (IVF). In patients with hydrosalpinx, removal of the blocked fallopian tube can improve IVF success rates, as the fluid in the tube can impair embryo development.[13]

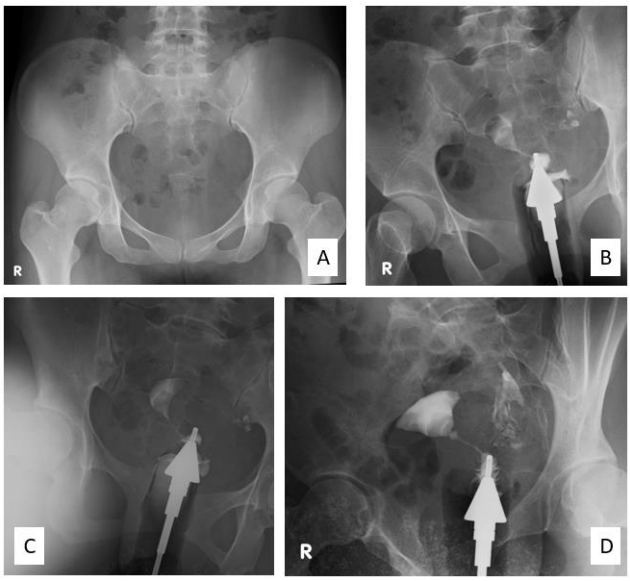


**Figure 4.** Adenomyosis. (A) Plain X-ray. (B) (C) (D) Contrast appears filling the cervical canal, uterine cavity, and left fallopian tube, which then backflows and fills the proximal vagina. The cervical canal is normal, with regular edges. The uterine cavity is in an anteflexed position, with smooth mucosa, and no additional shadow is visible. Multiple filling defects in the form of ovoid shapes with lobulated edges are seen in the distal uterine cavity, left uterine fundus, and right uterine horn.

This study found abnormalities such as arcuate uterus, didelphys uterus, and endometritis were more frequently found in patients with primary infertility with a prevalence ranging from 1.52% to 3.03%. This indicates that anatomical abnormalities and uterine inflammation play a major role in causing primary infertility, where patients have never achieved pregnancy.[21] Furthermore, the fallopian tube abnormalities, such as salpingitis and hydrosalpinx also more frequently found in patients with primary infertility with a prevalence ranging from 4.54% to 12.12%. These conditions tend to block sperm from reaching the oocyte, thus hindering the ability to achieve the first pregnancy.[9] In cases of secondary infertility, more commonly observed abnormalities were synechiae and unilateral hydrosalpinx, where one tube becomes blocked following infection or post-pregnancy trauma.

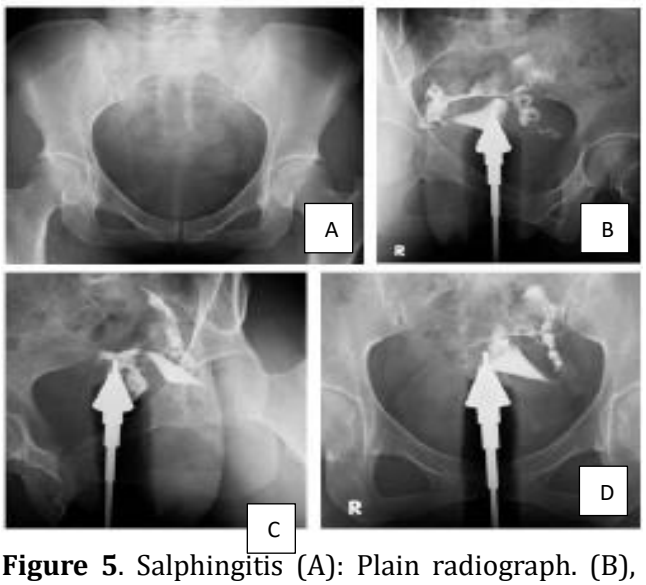


**Figure 5**. Salphingitis (A): Plain radiograph. (B), (C), (D): Contrast fills the uterine cavity and both fallopian tubes. The cervical canal appears normal with smooth edges. The uterine cavity is anteflexed, with normal size and shape, smooth mucosa, and no filling defects or additional shadows. Peritubal filling is observed in the left fallopian tube at the isthmic portion, with dilation in the ampullary part. The surrounding mucosa appears regular, and peritoneal spillage is present (+). Contrast fills the right fallopian tube with peritoneal spillage (+).

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This study further classified the fallopian tube patency based on the primary or secondary infertility. We found that there are 26 (39.39%) patients with bilateral patent tubes with primary infertility, 12 (18.18%) patients with unilateral non patent tube with primary infertility, 8 (12.12%) patients with bilateral non patent tubes with primary infertility. We also found that there are 11 (16.66%) patients with bilateral patent tubes with secondary infertility, 7 (10.61%) patients with unilateral non patent tubes with secondary infertility, and 1 (1.52%) patient with bilateral non patent tubes with secondary infertility. For those patients with patent bilateral tube, we suggest to undergo insemination while those with nonpatent tube either unilateral or bilateral, we suggest to undergo in vitro fertilization (IVF).

Tubal causes are attributed to both primary and secondary infertility with higher prevalence in secondary type making routine tubal evaluation in secondary infertility a recommendation. It accounts for 30-35% of infertility cases. Although our study indicates that there are more patients with tubal problems with primary infertility, primary infertility has also been found to be more prevalent than secondary in other studies.Increased number of secondary infertility patients could be due to inadequate care during previous pregnancies or previous abortions resulting in pelvic infections. Tubal abnormality such as blockage and dilatation was found most commonly in some studies.[6] Inflammation are mostly the prumary cause of blockage and/or dilatation. Infertile women with blocked fallopian tubes and hydrosalpinx account for 30% to 40% of the entire infertile population, while another one-third ot tubal infertility is caused by non-specific salphingytis. Laparoscopy is the gold standard to evaluate the structure of the fallopian tube and the relationship between the fallopian tube and other tissues and organs, accurately separate the fallopian tube adhesion and pelvic adhesion, restore the shape and movement of the fallopian tube and diagnose diseases like pelvic endometriosis. It can also be used at the same time.[1]

Patients with patent bilateral tube are often given the option to do intrauterine insemination (IUI). This can be done because even though the bilateral tube are patent, sometimes there are other factors that cause patient unable to be pregnant. It is not recommended for unilateral non patent tube because if ovulation occurs on the contralateral ovary of the patent fallo- pian tube, the cycle would be cancelled, considering the potential impact on pregnancy rate and patient prefererence.[18]


**Figure 6**. Hydrosalphinx bilateral (A): Plain radiograph. (B): Contrast fills the cervical canal, uterine cavity, and both fallopian tubes. (C): The uterine cavity is in a retroflexed position, with normal size and shape, smooth mucosa, and no filling defects or additional shadows. (D): Both fallopian tubes show dilation, particularly the right fallopian tube in the ampullary part, with no spillage (-). The left fallopian tube also shows distal dilation, with no spillage (-). The mucosa in both fallopian tubes appears regular.

Patients with tubal non-patentcy has two therapeutic options to overcome the mechanical obstructions present in tubal disease: in-vitro fertilization (IVF) or reconstructive surgery. The place of reconstructive surgery is a topic of debate, as selection of patients and the method for tubal surgery is challenging. IVF was primarily developed to treat tubal infertility and has been shown to be effective. However, a paradox

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emerged after recognition that IVF in patients with tubal disease was associated with lower implantation rates and an increased risk of early pregnancy loss, especially in hydrosalpinges. Hydrosalpinx fluid seems to have a key role to cause failure, and it is most likely caused by embryotoxic factors from the fluid. It can also interfere endometrial interaction with transferred embryo because the fluid might also be outside of the hydrosalphinx. Salpingitis can also cause some adhesion problem due to infective adhesions, nodules, injury of Fallopian tube and other infections.[1,12]

This study underscores the importance of HSG as part of the infertility evaluation process in patients. HSG provides direct visualization of the uterine and fallopian tube anatomy, which helps determine the cause of infertility, whether primary or secondary.[3] For patients with structural abnormalities like uterus didelphys or bicornuate uterus, corrective surgery may be performed to improve the reproductive organ anatomy and increase pregnancy chances. For patients with fallopian tube obstruction, reconstructive surgery or IVF may be a more suitable option. Overall, early diagnosis and appropriate management are critical to enhancing pregnancy outcomes for infertile patients. Assisted reproductive technologies (ART) such as IVF have proven to be effective solutions for patients with tubal abnormalities that cannot be corrected surgically.[21] Further research involving comprehensive evaluations of hormonal, immunological, and genetic factors is also necessary to gain deeper insights into the causes and treatment of infertility.

## CONCLUSION

This study provides a comprehensive overview of various anatomical abnormalities affecting infertility in patients undergoing Hysterosalpingography (HSG) examinations at Prof. Dr. I.G.N.G. Ngoerah General Hospital from January 2021 to June 2024. Based on the analysis, the age group 20-30 years was the most dominant among patients undergoing HSG, with the majority experiencing primary infertility, indicating that many patients face difficulties achieving their first pregnancy.

Uterine abnormalities, such as uterine retroflexion, didelphys uterus, and arcuate uterus, as well as fallopian tube abnormalities like hydrosalpinx and salpingitis, were found to have a significant impact on primary infertility. These findings underscore the importance of HSG as an efficient diagnostic method in detecting structural abnormalities in the female reproductive organs, providing valuable insights into fallopian tube patency and uterine conditions.

Fallopian tube patency disorders, both unilateral and bilateral, were identified as one of the main causes of infertility in this study. Conditions such as salpingitis and hydrosalpinx, which obstruct the passage of the egg and sperm through the fallopian tubes, hinder the fertilization process, while uterine abnormalities may disrupt embryo implantation.

The results of this study highlight the importance of early diagnosis and appropriate management of reproductive disorders in infertile patients. Furthermore, assisted reproductive technologies (ART), such as In Vitro Fertilization (IVF), can be a viable solution for patients with severe anatomical abnormalities. This study contributes significantly to understanding the relationship between age, type of infertility, and anatomical abnormalities, as well as their impact on pregnancy success in infertile patients.

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Not applicable

## DECLARATIONS

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