Effect of Patient-Centered Decision Counseling on Empowering Young Women Regarding Fertility Preservation Before Cancer Treatment

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Abstract:

Background: Chemotherapy and radiation therapy effectively eradicate cancer cells, but they can negatively impact the reproductive system, particularly in females, by reducing the quantity and quality of oocytes. **Aim:** to examine effect of patient-centered decision counseling on empowering young women regarding fertility preservation before cancer treatment. **Design:** a quasi-experimental study design was applied **Setting**: It was conducted at the outpatient clinics of the Oncology and Burns Hospitals, subordinating Beni-Suef University Hospital. **Subjects:** A purposeful sample of 100 young women planned to receive cancer treatment. **Tools:** four instruments were used. A structured interviewing questionnaire, barriers to fertility preservation discussion questionnaire, knowledge of fertility preservation questionnaire, and the Decisional Conflict Scale (DCS). **Results**: the study findings revealed that, within control group &study group, patient characteristics and beliefs about fertility preservation, as well as regrets about information and counseling, were key barriers to initiating discussions about fertility preservation with physicians. Moreover**,** the total score of knowledge regarding fertility preservation improved as;(64.0%,4.0%) of them had a poor and good level of knowledge pre-intervention , whereas, after one month, (6.0%,62.0%) of them had poor and good knowledge level with a statistically high significant difference (P= 0.001). Also, high significant reduction of the study group decisional conflict occurred: as no woman experienced optimal decision-making conditions pretest, whereas, after one month half of them were extremely certain to not have decisional conflict as compared to the control group. **Conclusion**: Patient-centered decision counseling improved fertility preservation knowledge among young women, reduced decision making conflict about whether to accept engagement in fertility preservation discussion or referral before cancer treatment. **Recommendation:** it is recommended to incorporate patient-centered decision counseling into standard cancer care to ensure patients are well-informed and confident in their treatment choices.

Keywords: Barriers- decisional conflict -fertility preservation -patient-centered decision counseling.

Introduction:

Every year, almost a million women in the United States are diagnosed with cancer. Women under 40 accounted for 10% of these cancer cases, and over 48,000 new cancer diagnoses were made for women between the ages of 15 and 39 **(Appiah et al.,2021).** Significant improvements in the early detection and treatment of cancer have led to a notable rise in survivability **(Siegel et al., 2022, Appiah, 2020).**

The incidence of infertility in men and women with cancer varies according to the disease, age, sex, diagnosis, and level of therapy. Women receiving treatment may experience early ovarian failure, organ loss, or an inability to produce healthy eggs for ovulation. It is difficult to forecast ovarian reserve with any degree of precision **(Cancer Council Australia, 2022).** By 2025, over 100 million women worldwide are expected to be at risk of losing their reproductive functions due to gonadal toxicity, and some may attempt to maintain their fertility **(Sun &Yeh, 2021).**

Amenorrhea brought on by chemotherapy is one of the side effects of cancer treatments, and it's not definite if menses will resume when treatment is over. Women may have a further decline in fertility up to three years after they start menstruating (**Razeti et al., 2023).** Consequently, it has been demonstrated that the long-term health consequences regarding potential impairment to reproduction are the most distressing aspects of survivorship. This might lead people to disregard healthcare information as a coping method for the accompanying anxiety and uncertainty **(Barton et al., 2013; Benedict et al., 2021).**

There are several options available to reproductive age women who may be exposed to gonadotoxic chemicals in order to protect their fertility, including embryos and oocytes cryopreservation, ovarian tissue transplantation, and ovarian shielding and transposition. Most of these operations entail ovarian stimulation, which requires an average of 12 days for oocyte harvesting prior to the administration of cancer drugs **(Appiah, 2020, Oktay et al.,2018).**

According to the American Society of Clinical Oncology (ASCO), a wide range of interconnected barriers and drives that exist at the person, interpersonal, and organizational levels have an impact on fertility preservation care that adheres to criteria. For example, in addition to other family members, the patient's parents and/or close relatives may provide influence during the decision-making process. Additionally, a variety of medical specialists work together to satisfy the needs of their patients, including those in oncology, primary care,

reproduction, endocrinology, surgery, nursing, and psychological care **(Anazodo et al.,2019).**

Organizational differences in insurance coverage, availability, and access to reproductive healthcare are additional factors contributing to challenges facing fertility preservation (FP) in the healthcare system. Furthermore, because of socioeconomic barriers such structural racism, black patients are less likely than white patients to receive FP, be treated in cancer specialized settings, or have access to it **(Dorfman et al., 2021).**

As part of their initial comprehensive care plan, patients undergoing potential gonadotoxic treatments should be given education and counseling regarding the impact of their illness or treatment on their potential for conception and options for FP, as recommended by the ASCO. The burden of infertility following cancer treatment is a potentially preventive issue **(Jeffrey et al., 2023, Oktay et al.,2018).**

The major advancements in the health care industry over the last 10 years are patient-centered care (PCC) **(Engle et al., 2021).** In order to provide care that is patient-centered, nurses must acknowledge the experiences, narratives, and perspectives of their patients and give them more attention while also considering and respecting their needs, values, and preferences **(Johnsson et al.,2018).**

Value-promoting care activities, such as encouraging educated, values-driven decisions during the anxious period before the commencement of cancer treatment, discussing and resolving barriers to FP, and referrals, may receive more attention than traditional care procedures. By providing evidence-based information on time, explaining this difficult issue in simple terms, facilitating referrals for fertility counseling, and providing personalized decision assistance **(Steinmann et al.,2021,Stacey et al.,2017).**

Significant of the problem:

Global Cancer Statistics reported 19.3 million new diagnoses of cancer in 2020, with long-term predictions showing a 1.8-fold increase in cancer incidence by 2030**(Sung et al.,2021).** As a result of higher survival rates for those with cancer discovered in recent years. One widely recognized worry about chemotherapy drugs is the potential for gonadotoxic adverse effects to result in lowered fertility **(Klijn et al.,2023).** Consequently, interest in FP has increased **(Zaami et al.,2022).** Due to low awareness of FP **(Phelippeau et al.,2019**), a severe shortage of fertility-related information support services(**Villarreal et al.,2021**), a broad range of FP medicines are available **(Ehrbar et al.,2019**) and a significant lack of fertility-related education and support services, young female cancer patients, however, seem to find it more challenging to make FP decisions that align with their values and preferences during the brief period between cancer detection and treatment commencement **(Urech et al.,2018&Mahey et al.,2020**).

Professional nursing practice is fundamentally centered on protecting patients' rights and human dignity **(Jafarian Amiri et al., 2020).** Supporting and defending patients' interests and health, giving them information, assisting them in making decisions, fostering patient empowerment and independence, relieving the patient of needless anxiety, respecting the values and beliefs of the patients, and providing training and patient interaction are all regarded as essential elements of the nursing profession **(Nsiah et al., 2019).**Thus, The disparities between women's expectations and wishes for FP and the information they need to know emphasize the necessity for empowering women for FP before cancer treatment.

Aim of the study

The current study aimed to examine effect of patient-centered decision counseling on empowering young women regarding fertility preservation before cancer treatment though:

1. Address barriers influencing whether or not young women planned to receive cancer treatment initiate a discussion about fertility preservation with a physician.
2. Design and implement patient-centered decision counseling for empowering young women regarding fertility preservation before cancer treatment.
3. Evaluate effect of patient-centered decision counseling on empowering young women regarding fertility preservation before cancer treatment.

Research hypotheses:

After the intervention, patient-centered decision counseling would empower young women by improving their decision making outcomes (reducing decisional conflict) and improving decision quality (knowledge of fertility preservation)regarding engagement in fertility preservation discussions, and referrals before cancer treatment.

Operational definition

Patient-centered care

Patient-centered care is health care that creates a partnership between doctors and patients to guarantee that decisions are made with the patients' needs, desires, and preferences in mind as well as that patients are given the necessary information and assistance to make decisions and participate in their own care**(Park et al.,2018).**

Patient-centered decision counseling

The goal of patient-centered decision counseling is to involve patients in the process of choosing their medical care. By giving patients the knowledge, resources, and direction they need to make decisions that are consistent

with their objectives, values, and preferences, it seeks to empower patients **(Epstein& Street, 2011).**

Fertility preservation

Also known as assisted reproductive technology which consists of a series of techniques as the act of freezing reproductive tissue, sperm, eggs, or oocytes with hopes of using them to conceive a person's own biological children in the future. It is feasible for men and women, girls and teenage boys, to maintain their fertility before cancer treatment **(ASCO,2013).**

Cancer:

An aberrant cell growth that spreads throughout the body, damages certain body parts, and has the potential to be lethal**(World Health Organization,2018).**

Subjects and methods

Study Design

To achieve its objective, the current study employed a quasi-experimental design with two groups. A design that is quasi-experimental involves applying a condition or intervention to one group (the study) and comparing the outcomes with a control group. The goal of this strategy is to identify causal links. Similar to experimental research, quasi-experimental research involves modification of an independent variable. In order to prevent bias, it is necessary to randomly assign people to the groups. Additionally, it controls for all unrelated variables and employs a wider range of statistical analyses and data collection methods.

Study Setting

It was conducted at outpatient clinics at the Oncology and Burns Hospitals, subordinating Beni-Suef University Hospital, serving the governorate and its surrounding governorates and the majority of the females belonged it were in the medium and lower socio-economic status groups. . It has six floors total, with two dedicated to cancer treatment, one to the burns department, and three floors filled with lecture halls for medical students. There are four halls in all. Apart from an expansive examination hall, the hospital is furnished with x-ray, analysis, and treatment equipment for patients suffering from cancer.

The Study Subjects:

A purposeful sample of 100 young women planned to receive cancer treatment (10% of the previous year's flow rate) was chosen, and fifty of the women were assigned to each of two groups: fifty in the control group received standard hospital care, and fifty in the study group received patient-centered decision counseling in addition to standard hospital care. The following equation was used to determine the sample size:

$n= N/ \{1+N (e)^2\}$ ***(Chandrasekharan et al., 2019)***

Where n = sample size, N = population size is 135 all through the course of the study.

e= 0.05 is the level of error

$n= 135/ \{1+135(0.0025)\} = 100$

50 control, 50 study group

The following criteria must be met in order to be eligible for participation in a study about FP according to the American Cancer Society's (2016) recommendations: women must be between the ages of 18 and 40 years, have recently received a diagnosis of breast cancer, gynecological cancer, colorectal cancer, myeloma, or lymphoma, and be at risk of infertility due to cancer.

Women over 40 years, women who previously engaged in fertility preservation or other fertility treatments before cancer diagnosis, women with pre-existing severe infertility issues unrelated to cancer (e.g., premature ovarian failure), women with advanced or terminal cancer, women who are currently pregnant, and women who received radiation therapy or chemotherapy before the current treatment were not allowed to participate in this study.

Tools of data collection:

There are four sections in the questionnaire.

Section I: women's' `socio-demographic data as age, marital status, number of children, education, occupation, if taking governmental support, residence, religion, diagnosis, age at diagnosis (years), fertility status at the time of diagnosis(presence of living children and number of living children present), number of abortions and number of living children), type of treatment have been received/ or are planned to be received for cancer, if has desire to have children, and awareness of fertility status (one question) as do you know if you could not be able to conceive or become infertile?

Section II: Barriers to fertility preservation discussion.

The survey was an updated version of an established questionnaire used by the Department of Epidemiology at the Netherlands Cancer Institute**(de Boer et al., 2005; van Leeuwen et al., 2011),(Adams et al.,2013) and (Nikita et al.,2023).**

A set of twenty-two item questionnaire to assess the patients' barriers influencing initiation a discussion about fertility with a physician; Three items for structural elements. Eight items for patient characteristics are measured with. Five items make up the practice of FP. One item for concerns regarding reproductive impairment and five items for regrets regarding fertility information and

counseling. Women were asked to indicate whether any of the following factors influenced their decision to initiate an FP discussion using a three-point Likert scale (ranging from "not at all" to "to a large extent"). Additionally, a free-text box was included.

Section III: knowledge of fertility preservation.

The questionnaire was created using published material on subjects related to FP **(Taylor & MA., 2016, Lambertini et al., 2018, Mahey et al., 2020)** and used to assess women's FP knowledge. Items were distributed across three subdomains: **1st domain** consisted of 7 items to assess the general understanding of fertility preservation. In order to emphasize the significance of preserving reproductive options in the face of cancer therapy**. The 2nd domain** consisted of 4 items to evaluate the knowledge of gonadotoxic effects of chemotherapy and radiation therapy, as well as the significance of fertility preservation techniques for women receiving cancer treatment. While **the 3rd domain** consisted of 5 items to highlight the knowledge of effects of cancer treatment on fertility in the future, with an emphasis on the mechanisms and dangers of radiation therapy, chemotherapy, and other types of cancer treatments. Talking with medical professionals about fertility preservation methods necessitates an understanding of these impacts.

The responses to each item were classified as either "yes/correct" = 1 or "no/incorrect/do not know" = 0. Higher scores indicated a greater degree of knowledge regarding fertility preservation. The total score varied from 0 to 16. The total knowledge and knowledge level for each domain were split into three groups: poor knowledge (less than 50% of the highest possible score), good knowledge (>65% of the maximum possible score), and fair knowledge (50–65% of the maximum possible score).

Section IV: The Decisional Conflict Scale (DCS)

The patients' decision-making process was measured using the DCS. The sixteen DCS items are broken down into five domains: feeling certain, feeling informed, feeling supported, feeling clear about their ideals, and feeling like they made the right choice **(O'Connor, 2010).** The DCS is a valid and trustworthy tool for making treatment decisions **(Pecanac et al., 2018).** The conventional DCS - Statement format is as follows: 5 response categories for 16 items. This version has been tested the most. For each question, 0 represents "strongly agree," 1 represents "agree," 2 represents "neither agree nor disagree," 3 represents "disagree," and 4 represents "strongly disagree." For a total of 16 items, inclusively, they are: a) summed; b) divided by 16; and c) multiplied by 25. The scale goes from 0 for "no decisional conflict, optimal decision-making conditions" to 100 for "very high decisional conflict. (severe decision-making difficulty)." As the following:

- Scores less than 25: Low decisional conflict.

- Scores between 25 and 37.5: Moderate decisional conflict.

- Scores above 37.5: High decisional conflict, indicating significant uncertainty and difficulty in decision-making.

Test-retest correlations and Cronback alpha coefficients greater than 0.681 indicate reliability. Regarding to construct validity: it makes a distinction between two known groups those who make decisions and those who delay them (effect size [ES]: 0.4–0.8) (**O'Connor,2010)** .

Validity and reliability of the tool:

The validity of the data collection tool was evaluated by six experts; three professors from maternal and newborn health nursing department and two professors from the oncology medicine department, one professor from the gynecology and obstetrics medicine. Test-retest correlations and the Cronbach's Alpha coefficient test were used in the current study to evaluate reliability.

Items	
knowledge of fertility preservation	0.765
Barriers to fertility preservation discussion	0.860
The Decisional Conflict Scale (DCS)	0.681

Ethical considerations:

Prior to commencing the study, the Scientific Ethical Committee of Faculty of Medicine -Beni-Suef University's granted research approval. Moreover, the Chief Executive of Beni-Suef University's and Head of Oncology and Burns Hospitals, given approval to carry out this study. The questionnaire had a cover sheet with a description of the study's objectives and an informed consent form attached on the first page. The women were informed by the researcher that they were free to leave the study at any time and that they were not required to give a reason. Women were also given guarantees that the information they provided would be kept private and used exclusively for the study.

Pilot study:

The instrument's validity and completion time were tested on ten women, or 10% of the total sample size. The women who took part in the pilot study were added to the full study sample because no modifications were made.

Field work:

The process of data collection took eight months from September 2023 to April 2024 throughout five phases: preparatory, assessment, planning, implementation, and evaluation.

The Preparatory phase:

The researcher looked through textbooks, periodicals, magazines, and internet searches in addition to more contemporary and historical literature in order to design the patient-centered decision counseling program and establish the data gathering method. Then translated data collection tools into Arabic. After that, a panel of specialists were given the data collection tools for review.

Assessment phase

Researchers interviewed women in control and study groups, discussing study objectives, procedures, and counseling sessions, obtaining their consent for participation. Following the women's agreement to participate in the study, Researchers conducted one-on-one interviews with women in control and study groups to evaluate their socio-demographic data(section I), barriers to FP discussion (section II) knowledge of FP(section III), and decision making process(section IV)regarding engagement in FP discussions, referrals, and treatment. Each woman took about thirty minutes to complete the questionnaire.

Implementation phase;

The study aimed to create a patient-centered decision counseling program, involving tailored health education, effective communication considering women's values, cultural beliefs, and preferences and incorporated it into the shared decision-making process, and addressing barriers during the stressful time of cancer treatment, to help women get ready for conversations with family and healthcare providers. The researchers conducted the program in the waiting halls three days a week from 10:00 am to 2:00 pm, with twelve young women selected weekly. The program included five tailored sessions, each lasting 30 to 45 minutes according to women's cancer types. Here, the schedule and structure for the sessions that were taught:

Session	Content
Session 1: Understanding fertility preservation; to provide introduction to the counseling process and address immediate concerns and questions	Focused on understanding fertility preservation, building rapport with women, gathering medical history, discussing cancer treatment impact, introducing fertility preservation options, and scheduling follow-up sessions.
Session 2: In-depth information session to provide detailed information on fertility preservation and explore the women's values and preferences	Involved providing comprehensive information on fertility preservation options (e.g., egg/embryo freezing, ovarian tissue cryopreservation), discussing risks, benefits, and success rates of each option, using easy-to-understand language and decision aids (e.g., visuals, pamphlets), clarifying misconceptions, addressing concerns, discussing timing, legal, ethical, and financial considerations, and encouraging women to reflect on their reproductive goals in relation to these options.
Session 3: Investigating women's barriers to initiate a discussion about fertility with a physician to build trust and establish a safe space for discussion	Using open-ended questions, the women's fears, concerns, and expectations were discussed, along with external and internal barriers identified, and potential conflicts such as disagreements with family or husband. The researchers planned to address them in subsequent sessions.
Session 4: Decision-making support The aim was to make knowledgeable FP decisions that aligns with their values and preferences, not to raise FP rates	The women's preferences were reviewed through counseling techniques (such as empathy, clarification, and reflection), conflict was reduced by ensuring the patient fully understands all options and weighted the pros and cons. The woman engaged in a shared decision-making process, discussed challenges and concerns with the chosen option coming up with possible solutions based on the resources or support they already had. A husband or family member participated, and emotional support was provided to address the doubts and worries that women and families had about fertility preservation.
Session 5: Emotional and psyc-hological support: to address the emotional and psychological impact of the decision and provide ongoing support and referrals as needed	Involved discussing the women's emotional response to a decision made , offering psychological counseling or refers to social workers and more easily accessible fertility center to them, demonstrating coping strategies such as mindfulness techniques, stress management, emotional validation, and conflict resolution techniques(e.g., structured dialogue, mediation), providing resources for continued support, and scheduling follow-up calls or meetings within the next weeks to ensure the patient feels supported and confident in their decision.

The study group was separated from the control group of eligible women. To prevent data passing from the study group to the control group, the control group who received routine hospital care was evaluated before the study group.

The control group was questioned by the researchers and is given routine hospital care which include: physical examination, laboratory investigations, cancer therapy with regular monitoring of its effects, discussing, managing side effects, and adjusting therapies as needed.

Phase of evaluation and follow-up: one month later, the researchers scheduled a weekly follow-up phone call or meeting at the pre-mentioned study setting to ensure the patient feels supported and confident in their decision. Following the implementation of the patient-centered decision counseling program, the evaluation phase entailed assessing women' changes in knowledge, and decision conflict regarding FP. The PowerPoint presentation and booklet utilized in the study were distributed to the the control group women at the final stage of the study.

Resources used : The researchers prepared program content in the form of PowerPoint presentation, media, decision aids (e.g., visuals, pamphlets) and booklet materials for young women with cancer, supplemented with various teaching methods like brainstorming, group discussion, and role playing.

4. Statistical Design

The Statistical Package for Social Sciences (SPSS) Version 26 was used to evaluate the data before they were examined. Descriptive statistics and correlation coefficients were employed to test the study hypotheses. The features of the women under study were described using descriptive statistics, including frequency, percentage, arithmetic mean, and standard deviation. To examine mean differences before and after the intervention, a paired (t) test was employed. The significance level is shown by the p-value. A difference was deemed statistically significant when the p-value was less than 0.05, and very significant when the p-value was greater than 0.001.

Results

Table (1) represents that there was no statistically significant difference among both groups concerning **socio-demographic characteristics** ($p > 0.05$).As mean age of the control and study groups were 23.92±3.607years and 24.36±3.009 years respectively. Concerning marital status, 52.0% and 70.0% of them were married at the cancer diagnosis time respectively. Regarding residence, (60.0%) of the control group were rural residents, and (54%) of the study groups were urban residents. As regards level of education, (34.0%) of the control group can't read and write and (36%) of the study group had primary education. Moreover, 48% of the control group and 40% of the study group were housewife.

Concerning **fertility at the time of diagnosis**, (68%&60%) of both groups haven't living children. The Mean± SD of children number of women who have children was (1.28±1.08& 1.24±0.771) of each group respectively, and (46%) of the control group have trouble to get pregnant. While;(44.0%) of the study group don't know their fertility status.

Regarding **the medical history of the studied women; table (2)** reveals no statistically significant difference among both groups as (30%) of the control group had cancer cervix , and (28%) of the study group had cancer breast. Moreover, (42%,30%,respectively) of the control and study groups planned to receive chemotherapy.

Regarding patients' barriers and concerns influencing initiation a discussion about fertility with a physician; Although there were obvious variations in the groups' levels of concern, these variations may not have been large enough to be considered statistically significant ($p > 0.05$) as **table (3)** reveals. Concerning infrastructural related concerns; the study and control group expressed more concern about lack of reproductive services(70%& 62%,respectively), while; proximity of reproductive health clinic (68%),and relationships to the unit(66%) were a notable concern, in the study group than the control group ($p > 0.05$). Regarding concerns related to the approach of preserving fertility; the study and control group have greater concern about insufficient experience(74% vs. 64%), no emphasis on infertility(68% vs. 70%). while; the study group showed higher concern regarding poor communication about future fertility(66%),low success rate(74%),and inapplicable health insurance(62%) than the control group($p > 0.05$) Regarding patient characteristics and beliefs about preserving fertility; the study and control group have a higher concern about; understanding of the available options(62% vs. 50%), financial strain (66% vs. 62%), can't delay cancer therapy(68% vs. 60%), terrible prognosis (68% vs. 60%). While; the study group showed more concerns about cancer type sensitivity to hormones, and that medical reasons preventing fertility preservation nearing significance though not statistically significant ($p > 0.05$). The study group reports more concern about reduced fertility and hormone synthesis (64% vs. 44% in the control group), this was close to statistical significance ($p = 0.059$).Regarding regrets related to information and counseling on fertility ;both groups show similar levels of concern regarding time for counseling (58% vs. 56%), improper information presentation (56% in both groups) with no significant difference while; the study group showed not being able to ask all questions(54%), not receiving assistance from professionals(64%) and the control group showed irrelevant alternatives and inadequate information(56%).

Figure (1and 2) reveals that (66%&70%, respectively), (62%&72%, respectively) of the control and study groups indicated that : **the patient's characteristics and beliefs about preserving fertility**(e.g., as low understanding of available options, financial strain, can't delay cancer therapy, cancer type is sensitive to hormones, refuses to talk about preserving fertility, terrible prognosis, not possible for medical reasons, not prepared, and too old, and **their regrets related to information and counseling on fertility**(e.g., as no time for counseling or ask all of the questions, improper ,insufficient information about FP alternatives) were **a key barriers and concerns that influenced whether or not young women with cancer initiate a discussion about fertility preservation with a physician**.

Table (4) shows a significant effect of patient centered decision counseling on improvement in the total level of **fertility preservation knowledge** of the study group of young women planned to receive cancer treatment. As prior the counseling program,(70.0%, 66.0%,62.0%, &16.0%,12.0%,20.0%) of them had a poor and good level of knowledge regarding general understanding of fertility preservation, the gonado-toxic effects of radiation and chemotherapy and the effect of cancer treatment on future fertility, respectively. Whereas, after one month, (20.0%,30.0%,28.0% &74.0%,62.0%,60.0%) of them had poor and good level of knowledge, respectively. Also, It was discovered that the total score of knowledge regarding fertility preservation improved as;(64.0%,4.0%) of them had a poor and good level of knowledge pre-intervention , whereas, after one month, (6.0%,62.0%) of them had poor and good knowledge level with a statistically high significant difference (P= 0.001).

Regarding the control group, there was no statistically significant improvement in the general understanding of fertility preservation and total score of knowledge regarding fertility preservation posttest in comparison to pretest($p > 0.05$). Whereas ;there was statistically significant improvement the knowledge regarding gonado-toxic effects of radiation and chemotherapy and the effect of cancer treatment on future fertility, respectively. As,(20.0%,24.0%&28.0%,14.0%) had average and good level of knowledge pretest, While ,(8.0%,16.0%&.40.0%,24.0%) had average and good level of knowledge posttest, respectively($p < 0.05$).

Table (5) reveals statistically high significant reduction of the study group of young women planned to receive cancer treatment **decisional conflict** after the **patient-centered decision counseling**: as no woman experienced optimal decision-making conditions pretest, whereas, after one month (50%)of them were extremely certain to not have decisional conflict. Moreover, the reduction in decisional conflict achieved in the five domains necessary for making treatment decisions: feeling certain, feeling informed, feeling supported, feeling clear about their ideals, and feeling like they made the right choice (P= 0.001).

Regarding the control group, there was no statistically significant reduction in the decisional conflict pretest when compared with posttest($p > 0.05$).

Table (1): Frequency and percentage distribution of the studied women regarding their demographic characteristics (n=100)

Items	Control group (n=50)		Study group (n=50)		X^2	p value
	No.	%	No.	%		
Age						
< 20 years	16	32.0	5	10.0		
20 < 25 years	12	24.0	27	54.0		
25 < 30 years	22	44.0	18	36.0	1.181	0.881
Mean±SD	23.92±3.607		24.36±3.009			
Marital status						
Single	11	22.0	8	16.0		
Married	26	52.0	35	70.0	4.337	0.888
Divorced	9	18.0	5	10.0		
Widowed	4	8.0	2	4.0		
Education level						
Can't read and write	17	34.0	15	30.0		
Primary education	11	22.0	18	36.0	13.876	0.608
Secondary education	10	20.0	8	16.0		
Postsecondary	3	6.0	4	8.0		
Tertiary education	9	18.0	5	10.0		
Occupation						
Student	7	14.0	4	8.0		
Full-time job	8	16.0	17	34.0	16.458	0.171
Part-time job	10	20.0	9	18.0		
Housewife	24	48.0	20	40.0		
Residence						
Urban	20	40.0	27	54.0	3.435	0.064
Rural	30	60.0	23	46.0		
Fertility at the time of diagnosis						
Has living children	16	32.0	20	40.0	2.589	0.108
Hasn't no living children	34	68.0	30	60.0		
No. of abortion						
Mean±SD	.400±0.606		.560±0.501		1.429	0.159
No. of living children						
Mean±SD	1.28±1.08		1.24±0.771		.194	0.847
Knowledge of fertility status						
I am fertile	17	34.0	19	38.0		
I have trouble to get pregnancy	23	46.0	9	18.0	2.403	0.662
I don’t know	10	20.0	22	44.0		

* Statistically significant at p≤0.05 ** highly statistically significant at p≤0.01

Table (2): Distribution of the studied women regarding their medical history (n=100)

Items	Control group (n=50)		Study group (n=50)		X^2	p value
	No.	%	No.	%		
Diagnosis						
Cancer Ovary	11	22.0	9	18.0		
Cancer Breast	13	26.0	14	28.0	20.555	0.196
Cancer Cervix	15	30.0	10	20.0		
Lymphoma	7	14.0	9	18.0		
Cancer Endometrium	4	8.0	8	16.0		
Type of treatment planned to receive for cancer?						
Surgery	12	24.0	14	28.0		
Chemotherapy	21	42.0	15	30.0	15.216	0.085
Radiotherapy	11	22.0	8	16.0		
Combination	6	12.0	13	26.0		

* Statistically significant at p≤0.05 ** highly statistically significant at p≤0.0

Table (3): Distribution of the studied women regarding barriers and concerns influencing their initiation a discussion about fertility with a physician (n=100).

Items	Control group (n=50)						Study group (n=50)						X^2	p value
	Not at all		To some extent		To a large extent		Not at all		To some extent		To a large extent			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
Infrastructural related concerns														
Lacks of reproductive services.	7	14.0	12	24.0	31	62.0	8	16.0	7	14.0	35	70.0	6.857	0.144
Proximity of reproductive health clinic	34	68.0	7	14.0	9	18.0	6	12.0	10	20.0	34	68.0	8.722	0.068
Relationships to that particular unit	34	68.0	7	14.0	9	18.0	9	18.0	8	16.0	33	66.0	8.030	0.090
Concerns related to the approach of preserving fertility														
Poor communication about future fertility.	15	30.0	12	24.0	23	46.0	7	14.0	10	20.0	33	66.0	9.351	0.053
Insufficient experience,	7	14.0	11	22.0	32	64.0	5	10.0	8	16.0	37	74.0	7.924	0.098
Low success rate,	6	12.0	19	38.0	25	50.0	7	14.0	6	12.0	37	74.0	6.459	0.167
Inapplicable health insurance ,	15	30.0	11	22.0	24	48.0	10	20.0	9	18.0	31	62.0	8.855	0.065
No emphasis on infertility	11	22.0	4	8.0	35	70.0	10	20.0	6	12.0	34	68.0	7.916	0.095
The patient characteristics and beliefs about preserving fertility														
Low understanding of available options,	22	44.0	3	6.0	25	50.0	8	16.0	11	22.0	31	62.0	8.398	0.078
Financial strain,	6	12.0	13	26.0	31	62.0	10	20.0	7	14.0	33	66.0	8.139	0.087
Can't delay cancer therapy,	3	6.0	17	34.0	30	60.0	9	18.0	7	14.0	34	68.0	8.408	0.078
Cancer type is sensitive to hormones,	8	16.0	18	36.0	24	48.0	9	18.0	10	20.0	31	62.0	9.147	0.058
Refuses to talk about preserving	27	54.0	11	22.0	12	24.0	33	66.0	9	18.0	8	16.0	8.063	0.089
Terrible prognosis,	12	24.0	8	16.0	30	60.0	4	8.0	12	24.0	34	68.0	9.144	0.058
Not possible for medical reasons,	5	10.0	17	34.0	28	56.0	5	10.0	13	26.0	32	64.0	9.286	0.054
Not prepared,	12	24.0	17	34.0	21	42.0	33	66.0	11	22.0	6	12.0	9.245	0.055
Concerns and worries about Impairment of Fertility														
Reduced fertility and shortage in hormone synthesis.	8	16.0	20	40.0	22	44.0	7	14.0	11	22.0	32	64.0	9.088	0.059
Regrets related to Information and Counseling on Fertility														
No time for counseling or ask all of the questions,	12	24.0	10	20.0	28	56.0	12	24.0	9	18.0	29	58.0	6.926	0.140
Not being able to ask all questions during counseling	14	28.0	13	26.0	23	46.0	10	20.0	13	26.0	27	54.0	5.22	0.265
Not assisted in making decisions by medical professionals.	13	26.0	11	22.0	26	52.0	10	20.0	8	16.0	32	64.0	8.553	0.073
Irrelevant alternatives and inadequate information about FP options	10	20.0	12	24.0	28	56.0	12	24.0	11	22.0	27	54.0	3.468	0.483
Improper information that was presented in a way that minimized its importance.	10	20.0	12	24.0	28	56.0	11	22.0	11	22.0	28	56.0	3.488	0.480

* Statistically significant at p≤0.05 ** highly statistically significant at p≤0.01

Figure 1 : Distribution of the control group regarding barriers and concerns influencing their initiation a discussion about fertility preservation with a physician (n=50).

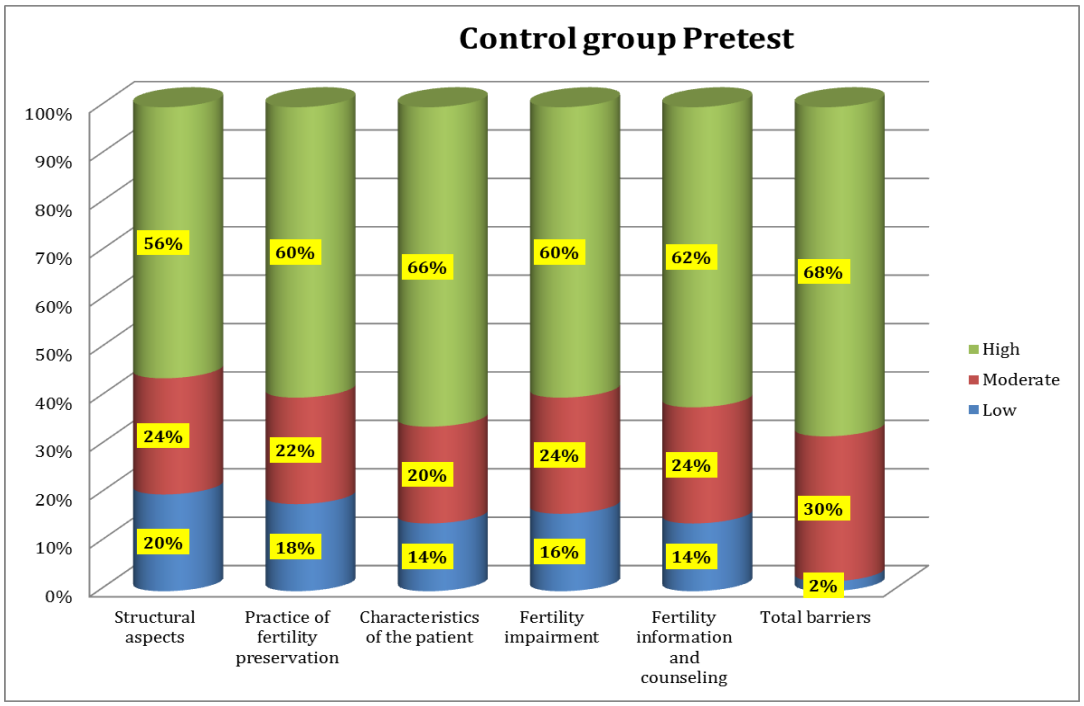

Figure 2 : Distribution of the study group regarding barriers and concerns influencing their initiation a discussion about fertility preservation with a physician (n=50).

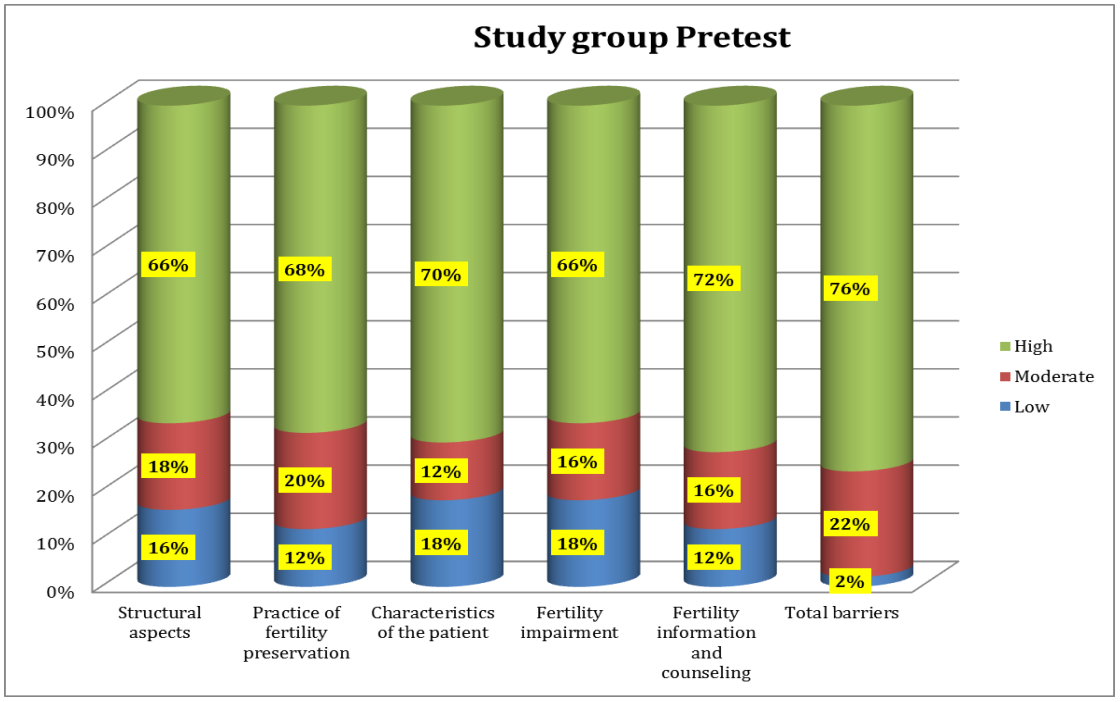

Table (4): Frequency and percentage distribution of the studied women regarding their fertility preservation knowledge pre and post-intervention (n=100).

Items	Control group (n=50)												X^2 (p value)	Study group (n=50)											X^2 (p value)
	Pre						Post							Pre						Post						
	Poor		Average		Good		Poor		Average		Good			Poor		Average		Good		Poor		Average		Good		
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Fertility preservation	33	66.0	6	12.0	11	22.0	28	56.0	7	14.0	15	30.0	2.345(0.673)	35	70.0	7	14.0	8	16.0	10	20.0	3	6.0	37	74.0	81.946(0.000**)
The gonadotoxic effects of radiation and chemotherapy	26	52.0	10	20.0	14	28.0	26	62.0	4	8.0	20	40.0	10.168(0.038*)	33	66.0	11	22.0	6	12.0	15	30.0	4	8.0	31	62.0	27.009(0.000**)
The impact of cancer treatment on future fertility	31	62.0	12	24.0	7	14.0	30	60.0	8	16.0	12	24.0	11.035(0.026*)	31	62.0	9	18.0	10	20.0	14	28.0	6	12.0	30	60.0	34.692(0.000**)
Total knowledge	25	50.0	20	40.0	5	10.0	18	36.0	26	52.0	6	12.0	1.897(0.387)	32	64.0	16	32.0	2	4.0	3	6.0	16	32.0	31	62.0	43.254(0.000**)

* Statistically significant at p≤0.05 ** highly statistically significant at p≤0.01

Table (5): Frequency and percentage distribution of the studied women regarding their decision making outcomes (decisional conflict) during pre and post intervention (n=100).

Items		Control group (n=50)										X^2 (p value)	Study group (n=50)										X^2 (p value)
		optimal decision-making conditions		Low decisional conflict		Moderate decisional conflict		High decisional conflict		severe decision-making difficulty			optimal decision-making conditions		Low decisional conflict		Moderate decisional conflict		High decisional conflict		severe decision-making difficulty		
		No.	%	No.	%	No.	%	No.	%	No.	%		No.	%	No.	%	No.	%	No.	%	No.	%	
Uncertainty (item 10, 11 &12)	Pre	0	0.0	3	6.0	11	22.0	31	62.0	5	10.0	8.164(0.518)	5	10.0	3	6.0	31	62.0	11	22.0	5	10.0	24.354(0.000**)
	Post	1	2.0	5	10.0	13	26.0	26	52.0	5	10.0		33	66.0	7	14.0	7	14.0	7	14.0	3	6.0	
Informed (item 1, 2 &3)	Pre	1	2.0	7	14.0	9	18.0	33	66.0	0	0.0	6.736(0.346)	1	2.0	1	2.0	42	84.0	6	12.0	1	2.0	19.335(0.0004**)
	Post	1	2.0	8	16.0	9	18.0	32	64.0	0	0.0		41	82.0	0	0.0	4	8.0	5	10.0	0	0.0	
Values clarity (item 4, 5 &6)	Pre	1	2.0	3	6.0	15	30.0	31	62.0	0	0.0	7.994(0.239	2	4.0	8	16.0	25	50.0	15	30.0	2	4.0	54.028(0.0008)
	Post	2	4.0	4	8.0	16	32.0	28	56.0	0	0.0		36	72.0	0	0.0	11	22.0	3	6.0	0	0.0	
Support (item 7, 8 & 9)	Pre	0	0.0	10	20.0	10	20.0	28	56.0	2	4.0	5.624(0.777)	2	4.0	6	12.0	31	62.0	11	22.0	2	4.0	17.8760.002**)
	Post	0	0.0	12	24.0	11	22.0	25	50.0	2	4.0		39	78.0	2	4.0	7	14.0	2	4.0	0	0.0	
Effective decision (item 13, 14, 15 & 16)	Pre	0	0.0	4	8.0	12	24.0	30	60.0	4	8.0	13.345(0.148)	2	4.0	3	6.0	33	66.0	12	24.0	2	4.0	20.283(0.002**)
	Post	0	0.0	9	18.0	13	26.0	24	48.0	4	8.0		39	78.0	1	2.0	5	10.0	5	10.0	0	0.0	
Total	Pre	0	0.0	1	2.0	6	12.0	43	86.0	0	0.0	3.18090.528)	0	0.0	6	12.0	42	84.0	2	4.0	0	0.0	16.054(0.0138)
	Post	0	0.0	2	4.0	8	16.0	40	80.0	0	0.0		25	50.0	23	46.0	2	4.0	0	0.0	0	0.0	

* Statistically significant at p≤0.05 ** highly statistically significant at p≤0.01

Discussion

Chemotherapy and radiation therapy can eradicate cancer cells, but they nevertheless have detrimental effects on the reproductive system. For example, in females, these treatments can reduce the quantity and quality of oocytes **(Kim et al.,2016).** Furthermore, gonadotoxic treatments may result in early menopause, which has long-term effects on cardiovascular and bone health as well as cognitive function, or full gonadal failure, which is characterized by premature ovarian insufficiency. Second, the majority of people will have some degree of decreased fertility, including a shorter reproductive window, even if they do not have complete gonadal failure **(Partridge et al.,2010).**

According to current guidelines, patients interested in preserving their fertility should be transmitted to the appropriate specialist as soon as feasible after discussing the likelihood of infertility with them before treatment begins. Whether a patient is a candidate for fertility preservation or decides against it, having this conversation may lead to a decrease in distress and an improvement in their quality of

life **(Patel et al.,2020).** Despite strict standards, many individuals do not receive sufficient reproductive referral or counseling following a cancer diagnosis **(Logan et al.,2017).**Therefore, it is essential to inform patients about hazards associated with chemotherapy. The aim of this study was to examine effect of patient-centered decision counseling on empowering young women regarding fertility preservation before cancer treatment.

Regarding **demographic characteristics**; the mean age of the control and study groups were 23.92±3.607and 24.36±3.009 years respectively. Concerning marital status, 52.0% and 70.0% of them were married at the cancer diagnosis time, respectively. With no statistically significant difference among both groups ($p > 0.05$).

These results are consistent with **Mahey et al., (2020)** in New Delhi, India, who assessed the knowledge about the effects of treatment for cancer on fertility and the available alternatives to FP, and discovered that; when the cancer had been identified, 29% of those who took part were single, and 71% of them were married. The study cohort's mean age (±SD) was 28.8±7.36 year. The current study conducted on young women planned to receive cancer treatment. Accordingly, women with age between the ages of 18 and 40 years were included in the study.

Since alkylating drugs are used in conjunction with other gonadotoxic therapy to treat around 50% of childhood cancer cases, a significant number of survivors may be at risk for infertility**(Mertens et al., 2015).**

According to the present study results, two thirds and more of both groups haven't living children. The Mean± SD of children number of women who have children was (1.28±1.08& 1.24±0.771) of each group, respectively, and near to half of control and study groups have trouble to get pregnant, don't know their fertility status, respectively. These findings may be due to an increasing number of women who are receiving cancer diagnoses prior to their anticipated number of children as a result of the trend toward postponed parenthood.

These results don't align with **Lehmann et al.,(2017)** in Columbus who asked ;are young people who survived cancer in their childhoods aware of their reproductive status? and found that despite being in prime age for reproduction, survivors had little awareness about their fertility status. Twelve (11.4%) of the survivors claimed they were infertile, while twelve (11.4%) indicated they were fertile. A majority of patients (n = 81, 77.1%) were unaware of their fertility condition. This could be because fertility discussions were not a usual component of care for survivors.

Although the likelihood of decreased fertility in cancer survivors varies and depends on a number of factors (including treatment type, location, the dose, and patient age) **(Waimey et al.,2015).** Fertility changes can be quite disappointing to people who desire biological children **(Ussher &Perz, 2019).**

The results of the current study indicate that, two thirds and more of the control and study groups indicated that : the patient's characteristics and beliefs about preserving fertility(e.g., as low understanding of available options, financial strain, can't delay cancer therapy, cancer type is sensitive to hormones, refuses to talk about preserving fertility, terrible prognosis, not possible for medical reasons, not prepared, and too old) and their regrets related to information and counseling on fertility(e.g., as no time for counseling or ask all of the questions, improper ,insufficient information about FP alternatives) were a key **barriers and concerns** that influence whether or not young women with cancer initiate a discussion about fertility preservation with a physician with no statistically significant difference($p > 0.05$). This may indicate a perceived or real deficiency in available services, dissatisfaction or communication issues with the healthcare unit, gap in effective communication regarding fertility preservation, lack of experience, lower efficacy in fertility preservation methods. The finding of this study supported with the findings of **Armuand et al., (2012)** in Sweden who examined how males and females with cancer perceive information about fertility and how they preserve fertility in relation to receiving treatment for cancer and reported that 80% of men and just 48% of women were informed about the possibility of infertility following cancer therapy. And illustrated the reason for this discrepancy may be due to the fact that men can begin cancer treatment immediately after sperms cryopreservation, which is a very simple and less expensive process than female FP procedures. Also, the time required for hormonal therapy to stimulate the ovar ies, postpone
treatmentof cancer , financial limitations, and anxiety over t

he hazards involved with stimulating the ovaries are just a few of the obstacles facing female approaches to preserve fertility.

The results of this study were confirmed by research of **Mahey et al., (2020)** in New Delhi, India, who discovered the primary care physician did not provide any information to over half of the women (68%) on FP or the impact of cancer therapy on future fertility. Patients who hoped to become fertile in the future gave their excuses for not seeking treatment: a lack of knowledge, financial difficulties, a lack of support from family members, and a concern of delaying cancer treatment. For 28.6% of the patients, inadequate information from their doctors was the main cause.

Additionally**, Moore et al., (2015)** in Cleveland who compared and evaluated the rates of failed ovary at two years, dysfunctional ovaries , as well as outcomes of pregnancy between individuals undergoing goserelin-containing chemotherapy and those undergoing goserelin-free chemotherapy, and found that, treatment for cancer is also delayed when preservation of fertility is pursued. Moreover, **Srikanthan et al., (2016)** in British Columbia who conducted the study to determine whether the frequency of: a) reproductive discussion recording and b) a referrals to preservation of fertility are increased by a program specifically designed for young patients with breast cancer, through a nurses navigation. Adding to the stress and ambiguity that the process of decision-making currently experiences. Furthermore, the time and money required to investigate these approaches act as barriers to selecting this course of action altogether. According to the current study findings; preserving fertility prior to starting treatment may receive less attention due to the strain of managing an unexpected cancer diagnosis and the need to start treatment quickly for more aggressive cases.

According to reports, the incidence of permanent amenorrhea in women who are fifty years of age or less after cancer therapy ranges from 33% to 76%**(Hulvat &Jeruss,2009).** Because of this, many young female survivors have serious concerns about their ovaries health and fertility. Moreover, Lack of orientation may lead to the loss of the chance to preserve fertility **(Fahmy & Mohamed, 2021).**

The present study results revealed a significant effect of patient centered decision counseling on improvement in the total level of **fertility preservation knowledge** of the study group of young women planned to receive cancer treatment. As prior the counseling program,(70.0%, 66.0%,62.0%, &16.0%,12.0%,20.0%) of them had a poor and good level of knowledge regarding general understanding of fertility preservation, the gonado-toxic effects of radiation and chemotherapy and the effect of cancer treatment on future fertility, respectively. Whereas, after one month, (20.0%,30.0%,28.0% &74.0%,62.0%,60.0%) of them had poor and good level of knowledge, respectively. Also, It was discovered that the total score of knowledge regarding fertility preservation improved as;(64.0%,4.0%) of them had a poor and good level of knowledge pre-intervention , whereas, after one month, (6.0%,62.0%) of them had poor and good knowledge level with a statistically high significant difference (P= 0.001). From the researcher point of view, this may be because physicians focused on the area of the body they were treating, delegated responsibility for fertility advising to other medical professionals, and did not consider fertility preservation to be their job. Additionally, there was statistically significant improvement the control group knowledge regarding gonado-toxic effects of radiation and chemotherapy and the effect of cancer treatment on future fertility, respectively. As,(20.0%,24.0%&28.0%,14.0%) of them had average and good level of knowledge pretest, While ,(8.0%,16.0%&.40.0%,24.0%) had average and good level of knowledge posttest, respectively($p < 0.05$). This might be due to (14.0%) of them were students and may gained information from other sources as internet and books. Also, they have health insurance that include conservative medical treatment as zoladex to preserve patient fertility.

These results are consistent with **Mahey et al., (2020) in** New Delhi, India, who found that merely 32% of the women responded positively when questioned about how cancer and its treatments could affect their ability to conceive in the future. Merely 28% of the women were aware of the gonado-toxic impact caused by radiation and chemotherapy when asked directly about it. Also, **Shin et al., (2019)** in Seoul, Korea who assessed the impact of education on the functioning of ovaries and fertility status in premenopausal breast cancer patients, and found that 56.5% of study participants were unaware of the effects of breast cancer therapies on functioning of ovaries and fertility status prior to getting education from medical professionals. After seeing instructional videos, only 1.8% of participants said they knew nothing. Furthermore, **Ibrahim et al.,(2023)** in Port Said who assessed the impact of an instructional package on oocytes cryogenic preservation on the attitudes and knowledge of females with gynecological malignancy, and reported that the investigated young women' understanding of cryopreservation improved statistically.

The present study results illustrated a statistically high significant reduction of **the study group** decisional conflict occurred after the **patient-centered decision counseling**: as no woman experienced optimal decision-making conditions pretest, whereas, after one month half of them were extremely certain to not have decisional conflict. Moreover, the reduction in decisional conflict achieved in the five domains necessary for making treatment decisions: feeling certain, feeling informed, feeling supported, feeling clear about their ideals, and feeling like they made the right choice (P= 0.001). From the researcher point of view, the choice of whether to seek pretreatment preservation is frequently challenging due to

potential adverse effects, failure risk, and uncertainty about the family size after cancer diagnosis, anxiety related to unanticipated cancer diagnosis and the need to start therapy quickly. The reduction in decisional conflict achieved as the main elements of the decisional counseling program that took place between the patient and the researchers was centered on the interactive discussion of treatment alternatives, dangers, and on addressing the patient's individual beliefs and preferences, the decisional conflict decreased and the process of decision-making shared between patients and researchers . Furthermore, decreased decisional conflict appears to depend on addressing and discussing the obstacles and barriers that young women planned to receive cancer treatment face when making informed decisions.

The results of this study have been confirmed by the study of **Stacey et al.,(2017)** in Canada who analyzed how decision aids affect those having to make decisions about screening or treatment, and proved that patient decision aids reduced patients' decisional conflict by enhancing knowledge, encouraging reasonable expectations, boosting self-efficacy, and boosting decision-making involvement. According to more than 115 randomized controlled trials**.** Decision aids are effective at improving patient involvement in medical decision-making and enabling them to be more knowledgeable and confident in their decisions**(Stacey et al.,2017).**

Also**, Deshpande et al., (2015)** in Boston, Massachusetts. who conducted systematic analysis to investigate the impact of preserving fertility with counseling on psychological effects such as satisfaction, regretful decisions made, and life quality , either in isolation or in conjunction with preserving fertility approach, and stated that women who received focused counseling for preserving fertility showed better coping mechanisms over time, as well as a decrease in long-term regret and discontent with their care. Furthermore, **Peate et al., (2012)**in Australia conducted a prospective evaluation of the effectiveness of a decision aid (DA) related to fertility- among young females with breast cancer in its early stages. They discovered that, the female recipients of the DA showed lower decisional conflict than the women who was given routine care .The DA most certainly achieved these objectives by encouraging fast and customized decision-making and providing more detailed information regarding reproductive alternatives. Additionally, **Kim et al., (2013)** in North Carolina who assessed the effectiveness of the FP counseling process and identified factors that predict patients who require FP from having decisional conflict. Revealed that 73% of patients made their treatment related decisions after receiving educational content, and all patients indicated that the content was useful.

Conclusion:

The control and study characteristics and beliefs about preserving fertility and their regrets related to information and counseling on fertility were a key barriers and concerns that influenced whether or not young women with cancer would initiate a discussion about fertility with a physician. Moreover, None of the issues reach traditional statistical significance thresholds ($p < 0.05$). The aim of the study was accomplished since the study's findings supported the research hypothesis, as the patient-centered decision counseling empowered young women's particularly in terms of improvement in the percent of women who has a good decision quality (e.g., fertility preservation knowledge) and reduction in decision making conflict about whether to accept engagement in fertility preservation discussion or referral before cancer treatment. The findings of this study may enhance the treatment of reproductive-age women who are susceptible to infertility due to cancer and improve their knowledge, decision making process.

Recommendations :

1.Incorporate patient-centered decision counseling into standard cancer care to ensure patients are well-informed and confident in their treatment choices.

2.Healthcare providers should receive training programs to effectively deliver patient-centered decision counseling, including communication skills, understanding decision aids, and understanding the specific needs of young women with cancer.

3.More information and commitment to ASCO recommendations are needed to increase conversations about reproductive risk and referrals to infertility specialists before cancer therapy.

4.More research or a larger sample size may be necessary to reach more firm conclusion about concern related to reproductive health and fertility maintenance..

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