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An Overview of Prospective Brides' Preconceptional Health Using "Elsimil Application"

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Abstract

Preconceptional health has significant effect on pregnancy outcomes. Preconceptional health should be identified during premarital screening to allow brides sufficient time to enhance their health status.

Aims: The objective of this study was to assess the preconceptional health characteristics of potential brides in Malang Regency using "Elsimil application".

Study design: A quantitative descriptive research methodology was employed in the study, utilising a secondary data analysis approach.

Place and Duration of Study: The data for the study was obtained from potential brides who completed the premarital screening questionnaire on the Elsimil Application between January and May 2022 in Malang, Indonesia.

Methodology: The used sampling technique was the total sampling technique. The variables studied were prospective bride's preconceptional health with sub-variables: age, BMI, Hb levels, upper arm circumference, and smoking behaviour which were collected using an instrument in the form of a checklist table.

Results: The findings of the descriptive statistical analysis, which included the investigation of the frequency and percentage, revealed that a significant proportion of potential brides in Malang Regency over the period of January to May 2022, who participated in the "Elsimil" premarital screening questionnaire, exhibited a preconception health state that was deemed to be at risk (61.1%).

Scientific Novelty: This research introduces the use of the Elsimil Application to improve the preconception health of prospective brides and grooms. Its novelty lies in the integration of digital technology to monitor health, provide health education, analyse risk data, and evaluate the effectiveness of applications in real practice, which has a positive impact on maternal and child health.

Conclusion: Premarital screening providers need to monitor prospective brides until their preconception health status is ideal.

Keywords: nutritional status; preconceptional health; pregnancy planning; prospective bride.

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Introduction

Women of childbearing age typically encompass individuals within the demographic range of 15 to 49 years [1]. The onset of reproductive maturity in females is characterised by the occurrence of menstrual episodes, indicating the appropriate development of the reproductive organs. This makes women of childbearing age potentially pregnant if the conception or fertilisation occurs so that the women is also closely related to the pre-pregnancy or pre-conception period. Health during the preconception period needs to be considered in order to prepare for a healthy pregnancy. Adolescence is the most optimal period for women to start preparing for preconception health. This is because according to Sainafat et al. (2020), the stage of youth is a phase of physical, psychological, social, and intellectual maturation [2]. Hence, it is essential for teenagers to cultivate a well-rounded reproductive well-being and embrace personal accountability, including the domains of physical, psychological, and social readiness, in anticipation of entering into matrimony and imagining parental roles during adulthood. However, there are still many young women in Indonesia who face problems related to reproductive health, one of which is the high rate of early marriage, CED, anemia, and smoking behaviour or exposure to secondhand smoke.

The premarital screening is an important step in preventing and reducing the health risks for the prospective bride and groom and their offspring. In Indonesia, there is a growing focus on this practice due to heightened awareness of the significance of reproductive and preconception health. Technological and research advances in premarital screening have resulted in a variety of new tools and methods that have the potential to improve preconception health outcomes. One significant advance is the integration of digital technology in premarital screening. Apps like "Elsimil" allow brides and grooms monitoring their health conditions in real-time and get personalised information. The app includes features such as medical check-up reminders, health education, and health risk assessments based on data entered by users. The study by Dermawan et al. (2023) shows that the use of digital health applications increases the compliance with medical recommendations and premarital health examinations among prospective brides and grooms in Indonesia. This application not only makes it easier to access information but also integrates various health data, such as family disease history and laboratory results, to provide a complete picture of preconception health [3]. Several new screening tools have been introduced in the last three years, showing a trend of increasing accuracy and ease of use. One example is the use of premarital genetic testing which can identify the risk of genetic diseases that may be passed on to children. Studies indicate that premarital genetic testing can lower the prevalence of genetic diseases in offspring by identifying couples at high risk and offering targeted genetic counseling [4]. Advances in premarital screening, including the integration of digital technology and the development of new screening tools, have demonstrated great potential in improving preconception health and long-term health outcomes. The implications of these advances include preventing disease, improving quality of life, and developing better health policies. By continuing to adopt and develop this technology, Indonesia can improve reproductive health and the overall welfare of society.

Research Problem

Throughout 2022, the Malang Regency Religious Court has granted 1,393 requests for marriage dispensation. This figure makes Malang Regency ranked as the region with the highest early marriage rate in East Java Province in 2022. Based on a preliminary study conducted at DPPKB Malang Regency, there are 5 sub-districts with early marriage rates, namely Jabung, Tumpang, Poncokusumo, Singosari, and Dampit Districts. In addition, the Riskesdas report shows that in 2018, the incidence of CED among non-pregnant late adolescent females in Indonesia was found to be 23.3%. Additionally, the prevalence of anemia in this same population has exhibited an upward trend, rising from 37.1% in 2013 to 48.9% in 2018.

Late adolescent girls also experience problems related to lifestyle, namely smoking and exposure to secondhand smoke. According to the results of the Global Adult Tobacco Survey (2022), the number of adult smokers has increased to 8.8 million in the last ten years, namely as many as 60.3 million adult smokers in 2011 and increased to 69.1 million adult smokers in 2021. Even though the majority of smokers are male, late adolescent girls are still at risk of being exposed to cigarette smoke at home which is in second place with the highest percentage of exposure, namely 59.3% [5].

Research Focus

Reproductive health issues encountered by young women can persist into the subsequent stage of pregnancy if not effectively managed. Therefore, the identification of preconceptional health is crucial prior to the occurrence of pregnancy, particularly for women in the childbearing age group who are on the doorstep of committing to marriage. This is because one of the goals of marriage is to have offspring and each couple wants healthy and intelligent offspring. The pre-pregnancy maternal condition plays a pivotal role in influencing the well-being of offspring. This statement is proven by the research of Barker et al. (2018) dan Stephenson et al. (2018) which states that women with good nutritional status and lifestyle before pregnancy have an increased likelihood of experiencing a favorable pregnancy outcome and delivering a newborn with optimal health than women who are just trying to improve their nutritional status and lifestyle after pregnancy [6,7].

The nutritional requirements of pregnant women are essential not only for their own health but also for the production of the placenta, fetal tissues, and the expansion of blood volume necessary for fetal development and maturation. While exposure to cigarettes which are teratogenic will interfere with the process of organogenesis in the fetus. If preconceptional health is not properly prepared, the growth and development of the fetus will also be disrupted. Consequently, the developing fetus in the womb is vulnerable to the risks of miscarriage, stillbirth, congenital anomalies, and low birth weight (LBW) [8]. The impact of health problems experienced continuously since in the womb will be permanent and cannot be corrected in the future. According to Dieny et al., (2019), the long-term impact of LBW on infants is the low level of child intelligence, neurological disorders, and growth and development disorders [9]. The assertion is supported by the research undertaken by Abbas et al. (2021) in the province of Sindh, Pakistan which stated that LBW increases the risk of stunting in toddlers [10].

Research Aim and Research Questions

One approach to assess preconception health in women of childbearing age involves conducting premarital screening, a practice facilitated by BKKBN through the "Elsimil application". The purpose of conducting premarital screening is to provide women the opportunity and period to enhance their health condition in anticipation of embarking on pregnancy through preventive measures, medical treatment, and making healthy lifestyle adjustments so that preconception health problems can be resolved earlier with appropriate management. Based on the contextual background provided, the aim was to conduct a study titled "A Comprehensive Examination of Prospective Brides' Preconception Health Using the 'Elsimil Application' in January-May 2022 in Malang District, Indonesia."

Research Methodology

General Background

A quantitative descriptive study using a secondary data analysis strategy was conducted among 550 prospective brides in Malang Regency. Malang Regency holds the highest prevalence of early marriage within East Java Province in 2022, ranking at the top in the region. Based on a preliminary study conducted at the Malang Regency DPPKB, early marriage in Malang Regency occurs in all sub-districts in Malang Regency. The 5 sub-districts with the highest rates of early marriage are Jabung, Tumpang, Poncokusumo, Singosari and Dampit sub-districts. Pregnancy at a very young age (< 20 years) is risky because the female reproductive organs have not yet reached perfection. Apart from that, adolescent girls also have a greater percentage of experiencing anemia and CED (Risksdas Report). So that the choice of location can provide an appropriate response to problems related to reproductive health for prospective brides, especially those planning a healthy pregnancy.

Sample / Participants / Group

The study utilised secondary data to represent the population from filling out the premarital screening questionnaire for prospective brides from DPPKB who are domiciled in 32 subdistricts in Malang Regency on the Elsimil Application in January to May 2022 with a total of 550 data using a total sampling technique. Total sampling technique is used to describe the preconception health of the population as a whole. To maintain the relevance and specificity of the study to the target group, the study included prospective brides who were domiciled in Malang Regency, subjects were excluded from the study if the questionnaire is incomplete or includes images unrelated to official examination results conducted at health facilities. This criterion ensures the validity of responses provided by respondents using the Elsimil questionnaire.

Instrument and Procedures

Basically, Elsimil is an application used to identify preconception health through premarital screening which is carried out three months before marriage. The use of the Elsimil application has been implemented on a national scale. By identifying preconception health in CPW, the Elsimil Application is anticipated to serve as a catalyst in mitigating the prevalence of stunting, maternal mortality ratio (MMR), and infant mortality rate (IMR) attributable to factors such as adolescent or advanced maternal age at conception and childbirth, maternal malnutrition, and exposure to tobacco smoke among women of childbearing age (WUS).

Three months before marriage, the prospective bride and groom will submit a marriage application at the local Religious Affairs Office. Then the prospective bride and groom will be given a blank containing 6 questions, namely age, weight, height, Hb level, LILA, and smoking behaviour/cigarette exposure along with recommendations for a health check at the Community Health Center.

The prospective bride independently enters the results of her health examination into the Elsimil Application premarital screening questionnaire, with assistance from local health cadres. The validity of the data entered is ensured by including a photo in the form of a blank form of the KUA which has been filled in by the Community Health Center after the examination, accompanied by the signature of the health worker and the stamp of the

Community Health Center where the examination was carried out. Data from the premarital screening questionnaire on the Elsimil Application will be stored on the Elsimil administrator website which is managed by government agencies, namely DPPKB Malang Regency.

Data Analysis

The data collection tool for the preconceptional health of the bride in the study was a checklist table for raw data. This study examined only one variable, namely the preconceptional health of the bride, which was determined by the accumulated scores: age, BMI, Hb levels, upper arm circumference, and smoking behaviour. These five criteria were then grouped into two categories, namely ideal or risky according to the standards that apply to each criterion. If all the criteria were in the ideal category, then the prospective bride's preconception health status was declared ideal. However, if there were one or more criteria that were in the risk category, then the prospective bride's preconception health status was declared at risk. The data obtained was processed using the descriptive statistics method, including frequencies and percentages to address the research questions.

Regarding ethical considerations, detailed research protocol to the Ethics Review Committee was submitted and has been authorised by the Health Research Ethics Committee of Poltekkes Kemenkes Malang, through the letter Number 536/VI/KEPK POLKESMA/2023. The submitted protocols included details on the informed consent process, explaining how participants were informed about the study, their rights, and how their data were handled. Therefore, the ethical clearance attained for the study safeguarded that the study observed rigorous ethical standards, gave attention to the prospective brides' welfare, and maintained the ethics of research integrity during the entire research process.

Research Results

Based on secondary data collected with checklist for raw data in prospective brides' preconceptional health in Malang Regency from January until May 2022, the data retrieved were subjected to quantitative analysis using tables, frequencies, and percentage.

Table 1. Indicators of Prospective Brides' Preconceptional Health

Criteria	N (550)	%
Age		
< 20 or > 35 years old	71	12,9
20 – 35 years old	479	87,1
Body Mass Index		
< 18,5 or $\geq$ 23,0 kg/m ²	252	45,8
18,5 – 22,9 kg/m ²	298	54,2
Hemoglobin level		
< 12 gr/dL	67	12,2
$\geq$ 12 gr/dL	483	87,8
Upper arm circumference's size		
< 23,5 cm	71	12,9
$\geq$ 23,5 cm	479	87,1
Smoking behavior		
Smoking	28	5,1
Not smoking	522	94,9

Note: N= total number of subjects, %= proportion of subjects based on criterias

Table 1 shows the characteristics of prospective brides in Malang Regency who filled out the premarital screening questionnaire on the Elsimil Application from January to May 2022 based on each indicator that determines their

preconception health. In the prospective bride's age column, it is evident that a significant proportion of potential brides enter into marriage between the ages of 20 and 35 years. Nevertheless, it is important to note that a subset of prospective brides, consisting of 12.9% (71 individuals), engage into marriage either before the age of 20 or after reaching the age of 35. In the BMI column, it can be observed that a significant proportion of potential brides possess a BMI within the normal range (18.5 – 22.9 kg/m²). However, 45.8% (252) of prospective brides had a BMI < 18.5 or ≥ 23.0 kg/m². Regarding the hemoglobin (Hb) levels, the majority of prospective brides had Hb levels ≥ 12 g/dL. However, 12.2% of prospective brides had Hb levels < 12 g/dL, indicating anemia. In the upper arm circumference column, it is known that the majority of prospective brides have a size of upper arm circumference ≥ 23 cm and only a few (12.9%) prospective brides have a size of upper arm circumference < 23.5 cm or experience Chronic Energy Deficiency (CED). In the smoking habits column, it is known that the majority of prospective brides do not smoke. However, there are still 5.1% of prospective brides who smoke/are exposed to cigarette smoke.

Table 2. Preconceptional health of prospective brides

Category	N (550)	%
Risky	336	61,1
Ideal	214	38,9
Total	550	100

Note: N= total number of subjects, %= proportion of subjects based on categories

Table 2 shows that the majority of prospective brides have preconceived health status which is at risk. With five criteria, namely age of marriage, BMI, Hb level, upper arm circumference, and smoking behaviour, the results obtained are in the form of an illustration that most prospective brides in Malang Regency for the January-May 2022 period who filled out the Elsimil premarital screening questionnaire were identified as having risky preconception health status (61.1%).

Discussion

The premarital screening in Indonesia has been recommended so that prospective brides and grooms can anticipate the occurrence of health problems that have the potential to affect the quality of the offspring they will produce, one of which is stunting. The screening carried out at the Community Health Center includes checking the age, BMI, Hb level, upper arm circumference, and smoking habits of the prospective bride. The results of the examinations are independently entered into a pre-marital screening questionnaire by prospective brides and grooms, assisted by health cadres using the Elsimil Application. This data is analysed in this study to derive conclusions regarding the preconceptional health characteristics of prospective brides.

Age of the Prospective Bride

This study showed that the majority of respondents married at the ideal age (87.1%). Even though the number is small, respondents who married at a risky age (12.9%) need to be in the spotlight. An individual is considered to be at risk if their age is below 20 or above 35 years.

Adolescent physical and psychological immaturity can present challenges during pregnancy and childbirth. Because their female reproductive organs are still developing, women who marry before 20 are physiologically vulnerable. Developing organs may suffer long-term damage during pregnancy. According to Herliana, et. al. (2018), early pregnancy increases the risk of abortion, preterm rupture of membranes, preeclampsia [12], and premature birth, which increases growth anomalies [13]. These factors may cause impaired development, low birth weight, birth defects, infection vulnerability, red blood cell deficiency, excessive bleeding after childbirth, and maternal death [14]. Early pregnancy also increases the risk of miscarriage or fetal death [15].

Individuals under the age of 20 are still considered adolescents psychologically, experiencing a transitional phase between childhood and adulthood. This age group is still in the process of exploring their identity and capabilities. Failure to establish a sense of identity during this period can lead to social withdrawal [16]. Early adulthood begins at 20, when people form deep relationships, make commitments, and start families. Marriage before 20 hinders adolescent development. Unmet developmental tasks in teens can be linked to their readiness to start a family and experience pregnancy, delivery, and parenthood. Self-awareness is important because without it, someone may be unprepared to care for and nurture others, including their children. According to the research conducted by Farida, et. al, 41.2% of teenage pregnant women were unprepared for motherhood [17].

Adolescent mothers often experience psychological stress due to their lack of readiness for pregnancy, childbirth,

and motherhood, which can elevate the risk of mental health disorders. This stress is associated with conditions such as post-traumatic stress disorder (PTSD), depression, anxiety, somatization, and impaired psychosocial functioning [18]. Teenage pregnancy and parenthood often lack social and financial support. This reduces knowledge, healthcare, and nourishment, increasing the likelihood of problems. Adolescents may not know about their pregnancy or refuse prenatal care. Lack of prenatal care may delay medical diagnosis and increase pregnancy complications. Besides, teen pregnancy is often linked to risky behaviors like smoking, drinking, and substance misuse [14]. This may increase pregnancy complications and harm the fetus.

Meanwhile, conception beyond 35 reduces fertility and egg production, making women susceptible. This enhances the probability of chromosomal abnormalities in older eggs that lead to genetic disorders, miscarriage [19], and delivery problems [20]. Early birth, low birth weight (LBW), congenital defects induced by diminished uterine blood flow, eclampsia, and anemia can result from advanced pregnancy [21]. Diabetes, hypertension, and cardiovascular disease are more common in elderly women [22,23]. Pregnancy complications may increase with this condition.

Under 20 and over 35 marriages pose risks to the mother and her future offspring. These two age groups are vulnerable to marriage if pregnant. The current healthcare practitioners concentrate pregnancy management by risk screening pregnant women using the Poedji Rochjati Screening Card and Mother and Child Health book. Those under 20 and 35 or older are too young and old, respectively. Young or elderly pregnant women are identified by health providers for increased surveillance during pregnancy to reduce pregnancy and delivery complications. To prevent pregnancy complications, maternal age screening should be done before pregnancy or marriage. When age is known before marriage, proactive interventions including educating people on healthy pregnancy planning, deferring pregnancy, or considering abortion can be taken. It would be more effective than intervening after pregnancy.

Body Mass Index of the Prospective Bride

This study showed that the majority of respondents had an ideal BMI (54.2%). Even though the number is small, respondents who have a risky BMI (45.8%) need to be highlighted. A BMI under 18.5 kg/m² puts a pregnant woman at risk for marriage since starvation might create health problems. Malnutrition disrupts reproductive function as well as growth and organ function. According to Boutari et al. (2020), underweight indicates low calorie intake, body weight, and body fat, which interferes with secretion, pulsatile, gonadotropin, and pituitary to produce reproductive hormones, increasing menstrual disorders [24]. Fetal growth and development will be affected by maternal underweight throughout pregnancy. The fetus's limited nutrition uptake during the first 1000 days of life may explain this phenomenon. Pregnant women who are underweight are at risk of developing anemia, experiencing challenging labor, and facing increased bleeding during delivery. Additionally, their fetuses are at risk of anemia, low birth weight, and neonatal illness. Li et al. (2018) found that underweight maternal pre-pregnancy affects cognitive scores like verbal comprehension and the prevalence of malnourished offspring [25].

Excessive nutrition not only impacts women's reproductive health beyond hunger. Dow & Szymanski (2020) found that obese women are more likely to become infertile. Besides, obesity frequently correlates with metabolic problems such as gestational diabetes, hypertension, and lipid abnormalities. These diseases may increase the likelihood of complications during pregnancy, such as spontaneous abortions, birth abnormalities, hypertension, gestational diabetes mellitus, macrosomia, IUGR, and stillbirths [26]. According to D'Souza et al. (2019), obesity in pregnant women increases the risk of caesarean delivery, perineal tears of degrees 3 and 4, postpartum infections, premature birth, small for gestational age, neonatal asphyxia, trauma at birth, respiratory distress, and hypoglycemia. Therefore, determining BMI before marriage enables more effective planning for a healthy pregnancy, including adjusting food portions, physical activity, and maintaining an ideal body weight, which are crucial factors beyond ANC management [27].

Hemoglobin Level of The Prospective Brides

This study showed that the majority of respondents had ideal Hb levels (87.8%). Even though the number is small, respondents who married at a risky age (12.2%) need to be in the spotlight. Anemia can hinder productivity in women due to its tendency to induce nonspecific symptoms such as weakness, exhaustion, lethargy, shortness of breath (especially during physical activity), palpitations, and headaches. These symptoms occur due to insufficient levels of hemoglobin, which is responsible for carrying oxygen to all tissues [28]. However, when a woman with anemia becomes pregnant, she will experience obstacles to the transfer of nutrients from the mother to the fetus, impacting its growth and development. Means (2020) states that iron deficiency can cause placental hypertrophy, increasing the chances of preterm labor, low birth weight (LBW), stillbirth, and maternal hemorrhage during labor [29].

Several innovations have been developed to screen for anemia, including the use of a website application designed specifically for assessing the risk of anemia [30]. Innovations are also being made to make checking hemoglobin levels easier, for example paper-based sensors integrated with smartphone applications to detect hemoglobin (Hgb) concentrations [31] and AI-enabled models to estimate hemoglobin levels precisely using non-invasive data captured by smartphones [32].

Anemia status should be determined prior to the initiation of pregnancy, specifically by premarital screening conducted three months prior to marriage. As per the DPPKB of Malang Regency, every potential bride, regardless of whether they are anemic or not, shall be provided with iron supplements in the form of 20 Fe tablets to be taken once a week and once daily during menstruation. The preconceptional management of anemia followed the guidelines proposed by da Silva Lopes et al. (2021), which suggested that iron therapy effectively raised hemoglobin levels and prevented iron deficiency in non-pregnant women of reproductive age [33]. Furthermore, the research conducted by Danefi & Apriasih (2020) demonstrated that a regular intake of iron, particularly in combination with vitamin C found in orange juice, which is a local commodity in Malang Regency is advised to increase Hb levels [34]. Prospective brides are also advised to adhere to the "Fill My Plate" guidelines provided by the Indonesian Ministry of Health (2018) in order to maintain a balanced diet. It is advisable to include iron-rich foods such as liver, eggs, fish, and chicken in the diet to prevent anemia even before conception [35].

Upper Arm Circumference's size of The Prospective Brides

This study showed that the majority of respondents had ideal upper arm circumference (87.1%). Even though the number is small, respondents who have a risky upper arm circumference (12.9%) need to be highlighted. Chronic Energy Deficiency (CED) typically hampers women's productivity since it diminishes their energy levels, rendering them feeble and incapacitated in doing their routine tasks.

The adipose tissue and the body's metabolic response to insufficient energy play a crucial role in the body's adaptation to inadequate dietary conditions within the context of Chronic Energy Deficiency [36]. Chronic Energy Deficiency can have a negative impact on health by raising the chances of developing metabolic disorders and hormonal imbalances [37]. Adipose tissue has a vital role in controlling metabolism, particularly in the regulation of glucose and lipid metabolism. Individuals with CED may experience altered metabolic regulation due to changes in the distribution of adipose tissue and hormonal responses [38].

Insufficient energy intake compared to energy expenditure in women of reproductive age can lead to Chronic Energy Deficiency (CED), which can affect several biochemical and physiological systems. Inadequate energy intake can disrupt the regulation of hormones, particularly affecting the hypothalamic-pituitary-ovarian axis in women [24]. Chronic endocrine disruption (CED) can have adverse effects on reproductive function by impeding the process of ovulation and reducing fertility. This disruption can lead to irregular menstrual cycles, amenorrhea (absence of menstruation), and hormonal irregularities, which can impact fertility and reproductive health.

If a woman experiences chronic energy deficiency (CED) during pregnancy, her body may not have sufficient resources to adequately support optimal fetal growth and development. Insufficient intake of essential nutrients such as proteins, vitamins, and minerals can reduce the availability of these nutrients to the fetus, potentially leading to restricted fetal growth [39]. CED may disrupt the hormonal balance in pregnant women, affecting the production of essential hormones needed to support pregnancy and facilitate the growth of the fetus. Hormones such as insulin-like growth factor 1 (IGF-1) and insulin play crucial roles in regulating embryonic growth [40]. Improper regulation of these hormones due to chronic energy deprivation (CED) might result in intrauterine growth restriction (IUGR) and low birth weight. Furthermore, CED might result in significant perinatal complications, such as stillbirth, preterm birth, and intrauterine growth restriction. Chronic energy deficiency (CED) can lead to deficiency disease, which in turn weakens the immune system and makes individuals more susceptible to infections and disorders [41]. These findings may have significant implications for women of childbearing age, particularly during pregnancy when a robust immune system is crucial for protecting the health of both the mother and the developing fetus.

Prior to marriage, it is crucial to determine the chronic energy deficiency (CED) status of prospective brides in order to implement appropriate preventive measures, such as ensuring sufficient nutritional consumption. It is crucial to determine the CED status of prospective brides prior to marriage in order to implement preventive measures, such as ensuring sufficient nutritional intake. During pregnancy, chronic energy deficiency (CED) in women may result in inadequate resources for optimal fetal growth and development. Insufficient intake of essential nutrients such as proteins, vitamins, and minerals can diminish their availability to the fetus, thereby potentially restricting fetal growth and development [42].

Smoking Behaviour of the Prospective Brides

This study showed that the majority of respondents did not have a smoking habit (94.9%). Even though the number is small, respondents who have a smoking habit (5.1%) need to be in the spotlight. Indonesia ranks sixth in global tobacco production, following China, Brazil, India, the United States, and Malawi. It produces a total of 136 thousand tons, accounting for around 19.1% of the world's total tobacco production. The three provinces that produce the most tobacco are East Java, West Nusa Tenggara, and Central Java [43]. Consequently, this facilitates convenient acquisition of cigarettes and contributes to a significant prevalence of both active and passive smokers in Indonesia.

The GATS survey data from 2022 indicate that the population of adult smokers has grown to 8.8 million individuals over the past decade. Specifically, there were 60.3 million adult smokers in 2011, which has risen to 69.1 million adult smokers in 2021 [44]. While it is true that most smokers are male, women who do not smoke are nonetheless vulnerable to being exposed to cigarette smoke at home. This is because home is the second most common area where women are exposed to cigarette smoke, with a percentage of 59.3%.

Smoking poses significant risks to reproductive health and overall well-being, underscoring the importance of premarital screening for potential brides and partners. Cigarette smoke, which contains carbon monoxide, obstructs oxygen delivery to vital organs in the bloodstream. Additionally, oxidants present in cigarettes interact with cholesterol, leading to the accumulation of fatty compounds on arterial walls. According to the Victoria Department of Health (2018), this process contributes to the development of heart disease, stroke, and vascular issues [45].

In pregnancy, smoking cigarettes may affect children throughout development. Cigarettes contain chemicals that can disturb organogenesis and cause miscarriage and ectopic pregnancy, birth defects and intellectual disabilities such as SIDS, asthma, and stillbirth. Hamadneh & Hamadneh (2021) found that pregnant women who smoke are more likely to have premature births, low birth weights, and low APGAR ratings [46]. Some studies link maternal smoking during pregnancy to congenital abnormalities including labioschizis and labiopalatoschizis. Secondhand smoke and active smoking carry the same health risks. Avşar et al. (2021) found that passive smokers during pregnancy harm the pregnant woman and her fetus [47].

Due to the significant adverse effects associated with the chemicals included in cigarettes, it is advisable to conduct a screening for smoking habits in potential brides before marriage. Prior to conceiving, potential brides may collaborate with their partners to abstain from smoking cigarettes. In Indonesia, the Prevention and Control of Non-Communicable Diseases offers support for smokers aiming to quit through a complimentary telephone service called "Quit-line quit smoking". The service offers the assistance of counselors who will aid in creating a smoking cessation plan, devising effective techniques to fight cravings, and avoiding triggers and other obstacles related to quitting smoking. The counselor will provide different alternatives for quitting smoking and offer support and assistance based on the chosen approach. At the next phase of the consultation, the counselor will reach out to you using the phone number you provided at registration. The timing of the call will be modified to accommodate the schedule that both parties have agreed upon [48].

Preconceptional Health of Prospective Bride

Each indicator that determines preconception health, namely age, BMI, Hb levels, upper arm circumference size, and smoking habits in this study showed small numbers. However, overall, the preconception health of prospective brides in Malang Regency using the Elsimil Application from January to May 2022 shows that the majority have preconception health at risk (61.1%). In scientific terms, if any single indicator is at risk, the overall preconception health of the bride-to-be is deemed compromised.

The interaction among the age, BMI, Hb levels, upper arm circumference size, and smoking behaviours of potential brides is intricate and can mutually impact one another. Each individual factor of the overall data, including age at marriage, BMI, Hb level, LILA, and smoking behaviour, has an equal influence on the health of the mother and the well-being of her future child, as previously explained. Hence, the Elsimil program will autonomously identify precarious preconception health if any individual component is deemed risky. The purpose of this is to enable each prospective bride to foresee the potential threats associated with each component and implement targeted management strategies to mitigate any threats to their preconception health.

Young women's reproductive health issues might persist throughout pregnancy if not addressed. Preconceptional health is important before marriage because childbirth is generally a major goal. The mother's health before pregnancy will affect the children's quality. Barker et al. (2018) and Stephenson et al. (2018) found that women who maintained optimal nutritional status and adopted a healthy lifestyle before pregnancy were more likely to have a successful pregnancy and deliver a healthy infant than women who tried to improve their nutrition and

lifestyle after pregnancy [6,7]. Preconceptional health should be assessed three months before marriage so brides have the opportunity to create preconceptional supporting habits and improve their preconceptional health status.

The policy of mandating preconception health screening before marriage is justified due to the significant advantages derived from the presence of such a system for potential brides and grooms regardless of the screening result. It is advisable for prospective brides and grooms to prioritise preconception health screening when they are intending to start a family. However, this policy will only be effective and have a significant impact on the health beliefs of future brides if there is an evaluation and ongoing monitoring of initiatives aimed at improving the health status of vulnerable brides and grooms until they achieve optimal health. To introduce this fresh approach, the aid of community-based posyandu cadres is required. Posyandu cadres are responsible for leading the efforts to achieve the optimal preconception health condition. Posyandu cadres are those that are seen as being in close proximity to the community, hence they are anticipated to effectively communicate information pertaining to health misconceptions [49] through providing essential health services, serving as health instructors, mobilising and empowering the community, and monitoring community health [50].

Conclusions and Implications

In conclusion, this study evaluated the prospective brides' preconceptional health in Malang Regency from January to May 2022. Based on the problem formulation, the study concluded that a significant majority of prospective brides exhibited a preconception health status at risk. This underscores the critical need to prioritize and improve preconceptional health among prospective brides. Numerous studies have established that preconception health serves as a predictor of pregnancy outcomes. Therefore, the period before pregnancy or the preconception period is the most appropriate moment to improve health status, especially nutritional status and a healthy lifestyle. However, most women will only try to improve their health status after receiving counseling at their first antenatal visit or after pregnancy. This results in improvements in nutritional status and a healthy lifestyle not being able to achieve the expected results when the 1000 HPK has occurred. In other words, good health status will not be maintained if women do not prepare well before pregnancy, resulting in CED, anemia and exposure to cigarette smoke in pregnant women.

Indonesian women have recently been introduced to promotive and preventative concepts of family planning through preconception health screening offered by the Elsimil application. However, this relatively new concept is not yet widely recognized and supported by society. As scientific knowledge progresses and social media usage grows, Indonesian women are becoming increasingly aware of the importance of preconception care. They will likely seek out promotive and preventive measures that offer convenient technological access and can be independently pursued, even at an early stage of preconception health. Specifically, this occurs when Indonesian women enter adolescence. Due to the prevailing trend, it is expected that a significant number of Indonesian adolescents would enter nuptials in the few years.

Suggestions for Future Research

This study underscores the importance of enhancing preconception health services by educating individuals about preparing for a healthy pregnancy well before conception. Education should encompass accurate information about the significance of preconception health, how to access these services, and steps to improve preconception health. Implementing workshops, training sessions, and educational campaigns for prospective brides can empower them to maintain their preconception health. Additionally, involving health cadres and village youth communities in awareness campaigns can improve preconception health. The government should strengthen assistance programs for prospective brides and grooms to achieve ideal preconception health before pregnancy. Further research is needed to evaluate the health actions taken by prospective brides and grooms to improve preconception health and assess the results. These recommendations aim to empower prospective brides with knowledge and awareness, thereby enhancing preconception health outcomes and subsequent pregnancy outcomes in couples of childbearing age. This approach ensures comprehensive support for preconception health.

Declarations

Author Contributions

Conceptualisation, Nadya. and Lisa.; methodology, Nadya. Suprapti. and Lisa.; software, Nadya.; validation, Suprapti, and Lisa.; formal analysis, Nadya.; writing—original draft preparation, Nadya and Lisa.; writing—review and editing, Lisa.; visualization, Lisa.; supervision, Suprapti, Herawati and Sunaeni.; project administration, Nadya.; funding acquisition, Nadya. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board (or Ethics Committee) of the Health Research Ethics Committee of Poltekkes Kemenkes Malang (536/VI/KEPK POLKESMA/2023).

Informed Consent Statement

Not Applicable.

Conflicts of Interest

The authors declares that there is no conflict of interest regarding the publication of this manuscript. In addition, ethical issues, including plagiarism, informed consent, infringement, falsification and falsification of data, multiple publication and submission, and redundancy have been fully considered by the authors.

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