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The Correlation Between Vaginal Hygiene Practices and the Prevalence of Fluor Albus Among Pregnant Women at Tamangapa Health Center

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ABSTRACT

Introduction: Flour albus, or vaginal discharge, affects reproductive health globally, including in Indonesia. It may be physiological or pathological, indicating an infection or another health issue. Pregnancy hormones increase the risk of flour albus; therefore, vaginal hygiene is crucial. However, many pregnant women lack information on hygiene, increasing their risk of pathological disorders. This study investigates the association between vaginal hygiene and flour albus in pregnant women undergoing ANC at Tamangapa Health Centre, a topic that has been rarely studied.
Methods: This study employed a cross-sectional design using a quantitative approach. A total of 52 pregnant women in their second and third trimesters were recruited through incidental sampling during ANC visits. Ethical approval and informed consent were obtained prior to data collection. Data were gathered through questionnaires and vaginal discharge examinations. Analyses included univariate, bivariate, and multivariate methods, with the Mann-Whitney Test used for statistical significance.
Results: The findings revealed that 37 respondents experienced physiological fluor albus despite adhering to appropriate vaginal hygiene practices. Statistical analysis showed a significant correlation between vaginal hygiene and the type of fluor albus, with a p-value of 0.000 ($p < 0.005$).
Conclusion: The study stresses the need for vaginal hygiene in pregnant women to prevent pathological leukorrhea. Vaginal care education reduces complaints and improves reproductive health. This research has major implications for public health policy, particularly in prenatal care, to raise awareness and improve hygiene. It can also help build community-based preventive programs and integrate vaginal hygiene education into antenatal care to lower reproductive health risks.

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INTRODUCTION

Fluor albus, or atypical vaginal discharge, is a common clinical issue among pregnant women and can be classified into healthy and pathological fluor albus (1–3). It is frequently attributable to multiple reasons, such as hormonal fluctuations, altered immunological responses, and microbial infections. Physiological fluor albus is a clear, odorless vaginal discharge that is not itchy or excessive. Pathological fluor albus refers to vaginal discharge that is cloudy and thick, showing yellow, gray, or green tinges, along with an odor and itching (2,4). The predominant etiological factors of pathological fluor albus are bacteria, fungi, and parasites(1). Pathological fluor albus can be caused by infection with *Neisseria gonorrhoeae, Chlamydia trachomatis, Trichomonas vaginalis, Candida species*, and Bacterial vaginosis. Other factors that can cause leukorrhea are bacterial imbalances in the vagina and hormonal changes during pregnancy, so it is a condition that can be concerning during pregnancy because it can affect the health of the mother and the developing fetus (5,6).

Pregnancy leads to physiological changes in the vaginal environment, increasing susceptibility to infections and abnormal discharges, potentially causing discomfort, anxiety, and complications if left untreated (7,8). Pregnancy triggers substantial hormonal and immunological modifications, resulting in transformations to the vaginal environment. This predisposes women to infections, including bacterial vaginosis, candidiasis, and other disorders characterized by abnormal discharge (9).

Genital infections have become a serious public health problem, common in both developed and developing countries. The prevalence of bacterial vaginosis (BV) was found to be 8%-75%, the prevalence of vulvar vaginal candidiasis was 2.2%-30%, and the prevalence of trichomoniasis was 0%-34%. More than one million sexually transmitted infections (STIs) are spread worldwide every day (4,10).

According to the WHO, 75% of all women in the world will experience fluor albus at least once in their lives, and 45% will experience it twice or more, while European women experience up to 25%. Candida albicans bacteria is the most common cause of fluor albus. In Indonesia, the number of fluor albus cases is increasing (11). Research results show that as many as 52% of women in Indonesia experienced vaginal discharge in 2015. This increased to 60% in 2016, 70% in 2017, and almost 55% in 2018. Fluor albus is notably prevalent in regions like Indonesia, where 70-80% of pregnant women report this condition. Moreover, 40% of women experience pathological discharge associated with infections such as candidiasis or bacterial vaginosis. In contrast to developed nations, where abnormal discharge rates are typically lower at around 10-20%, developing countries face higher rates of abnormal discharge due to limited healthcare access, insufficient sanitation education, and cultural practices (12,13).

Studies indicate that poor vaginal hygiene practices, such as using scented soaps, excessive douching, and wearing non-breathable underwear, can disturb the natural balance of vaginal flora, increasing the likelihood of infections (7,14). Conversely, adhering to optimal hygiene practices can mitigate the risk of infection and complications related to abnormal discharge (13,15).

Research conducted in Makassar, Indonesia, and South Asia indicates that inadequate genital hygiene, regular douching, and insufficient knowledge regarding appropriate care during pregnancy elevate the likelihood of abnormal vaginal discharge. In these regions, most pregnant women with fluor albus display symptoms of bacterial vaginosis or yeast infections, frequently worsened by limited access to healthcare (6).

Poor hygienic behavior might lead to the development of issues in the reproductive organs. Flour albus can be caused by women's improper vaginal hygiene practices. These behaviors, such as unsanitary defecation and urination, involve utilizing contaminated water, incorrect cleaning methods, excessive use of soap, perfume, or vaginal cleansers for washing, wearing tight pants that do not absorb sweat, and infrequent pants changes. Pregnant women who practice good vaginal hygiene have a lower prevalence of abnormal flora albus than pregnant women who do not maintain good hygiene.

Whether pregnant women at Tamangapa Health Centre Makassar with fluor albus have implemented proper vaginal hygiene behavior or not, researchers want to build upon prior investigations by specifically examining “the correlation between vaginal hygiene behavior and the incidence of fluor albus in pregnant women at Tamangapa Health Centre" where the study's findings are anticipated to serve as the foundation for ensuring continuous care from pregnancy to childbirth, particularly in terms of genital hygiene to avoid vaginal discharge.

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METHOD

This study employs a quantitative research approach, specifically utilizing observational analytic research with a cross-sectional design. Its objective is to establish the correlation between vaginal behavior and the occurrence of flour albus in pregnant women at the Tamangapa Health Centre in 2024. The study was carried out at the Tamangapa Health Centre from March to May 2024. The study focused on the independent variable of vaginal cleanliness among pregnant women. The dependent variable in this study is the occurrence of fluor albus in pregnant women. The population of interest in this study consisted of 52 pregnant women who received antenatal care (ANC) at Tamangapa Health Centre. The formula used to determine the sample size in this study is the Slovin formula.

A systematic questionnaire was used to collect data on demographic factors and vaginal hygiene behaviors. The questionnaire that was utilized was assessed for validity and reliability to make sure that the questions asked were able to accurately and consistently measure the variables. To reduce the impact of social pressures that could lead to respondents providing incorrect answers, the questions in the questionnaire were answered through direct interviews with respondents in a closed room that could only be heard by the researcher. Before completing the questionnaire, the respondents were provided with thorough explanations in order to guarantee that they comprehended the questions accurately and provided truthful responses. A vaginal secretory examination was performed in addition to the questionnaire in order to confirm the accuracy of the information that was collected from the respondents' self-reports. The data that has been gathered will be documented and further classified according to the research goals. It will then be analyzed using the Statistical Package for the Social Sciences (SPSS).

The analysis employed consists of univariate, bivariate, and multivariate analyses. Univariate analysis is a descriptive analysis that examines the properties of each variable, focusing on vaginal hygiene behavior and the occurrence of flour albus. Bivariate analysis was conducted to explore the relationship between two variables, specifically the dependent and independent variables. The study aimed to identify the independent variables with the most significant impact on the dependent variable.

Ethical Approval

The ethics committee has granted approval for this research under the reference number E.050/KEPK/FKIK/II/2024.

RESULTS

Table 1 indicates that the majority of pregnant women included in this research were in the 20-30 age group (69.2%) and the third trimester (76.9%) had the maximum gestational age among the 52 pregnant women who participated in this study. The typical primiparous mother was a participant. According to 22 (42.3%) respondents, the majority of expectant women have completed primary education. Additionally, 46 (88.5%) respondents do not work, and 37 (71.2%) respondents have experienced physiological fluor albus.

The following research results were obtained through data processing and analysis.

Table 1. Distribution of Respondents based on Characteristics of Pregnant Women at Tamangapa Health Center in 2024

Categories	Frequencies (n)	Percentage (%)
Age (in years)		
<20	2	3.8
20-30	36	69.2
>30	14	26.9
Gestational Age		
2nd Trimester	12	23.1
3rd Trimester	40	76.9
Gravid		
Primipara	17	32.7
Multypara	35	67.3

Categories	Frequencies (n)	Percentage (%)
Education		
Basic Education	22	42.3
Secondary Education	20	38.5
Higher Education	10	19.2
Job		
Working	6	11.5
Not Working	46	88.5
Fluor Albus		
Physiological	37	71.2
Pathological	15	28.8
Total	52	100

Primary Data, 2024

In the study, it was found that most of the respondents' vaginal hygiene behavior was sufficient; however, there were still respondents with poor behavior as shown in Table 2. Table 2. shows that 16 people (30.8%) of respondents were included in good vaginal hygiene, 27 (51.9%) respondents experienced adequate vaginal hygiene, and 9 (17.3%) respondents experienced poor vaginal hygiene.

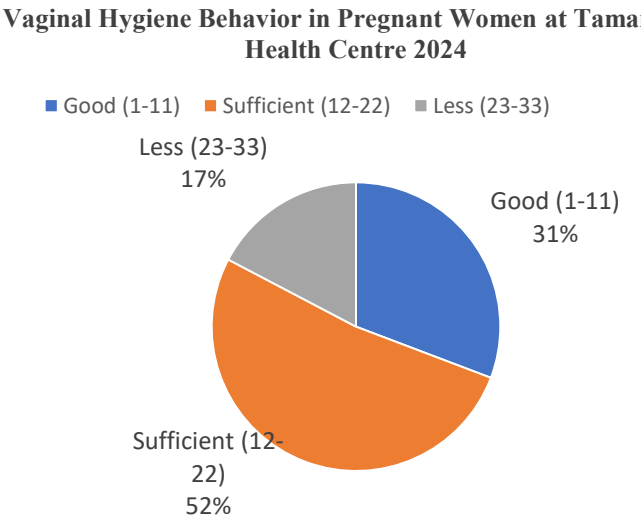

Figure 1. Distribution of respondents based on vaginal hygiene behavior variables in pregnant women at Tamangapa Health Center in 2024
Primary Data, 2024

According to the statistical test results in Table 3, the Mann-Whitney Test yielded a p-value of 0,000 (<0,005) in the non-parametric analysis. This indicates that the incidence of fluor albus in expectant women at the Tamangapa Community Health Centre is correlated with vaginal hygiene levels.

Table 2. Relationship between Vaginal Hygiene and the Incidence of Flour Albus for Pregnant Women at the Tamangapa Community Health Center in 2024

	Flour Albus	Frequency (n)	p-value
Vaginal Hygiene	Physiological Albus	37	0,000
	Pathologycal albus	15	
	Total	52	

Primary Data, 2024

According to Table 3, eight of the eleven vaginal hygiene behaviors have a p-value of less than 0,25. The multivariate analysis test will include vaginal hygiene behaviors with a p-value of less than 0,25. The purpose of a p-value of less than 0,25 is to offer a significant opportunity to influence the dependent variable.

Table 3. Relationship between Vaginal Hygiene Behavior and the Occurrence of Flour Albus

	Fluor Albus	**Frequency (n)**	**p-*value***
The application of cleansing products to female genitalia.	Physiological	37	0,010
	Pathological	15	
Rinsing the genitals from the rear to the front.	Physiological	37	0,000
	Pathological	15	
Pat the genital area dry after urination or defecation.	Physiological	37	0,011
	Pathological	15	
Wear tight underwear	Physiological	37	0,086
	Pathological	15	
Reduce the frequency of changing pants to fewer than twice a day.	Physiological	37	0,162
	Pathological	15	
Utilize undergarments that are not made of cotton.	Physiological	37	0,000
	Pathological	15	
Post-coital vaginal care	Physiological	37	0,524
	Pathological	15	
Thoroughly clean the toilet seat before use.	Physiological	37	0,002
	Pathological	15	
Use flowing water when cleansing the vagina.	Physiological	37	0,000
	Pathological	15	
Engage in daily bathing twice, once in the morning and once in the evening.	Physiological	37	0,000
	Pathological	15	
Pantyliner Use	Physiological	37	0,002
	Pathological	15	

Primary Data, 2024

Table 4, shows the logistic regression test to demonstrate the multivariate test results of vaginal hygiene behaviors that have an association with the incidence of flour albus. Of the 8 vaginal hygiene behaviors examined, the vaginal hygiene behavior that has a greater chance of affecting the incidence of flour albus is washing the genitals from back to front with a Relative Risk (RR) of 30.147 and a 95% CI 1.071-848.358.

Table 4. Analysis of Vaginal Hygiene Behavior that Affects Incidence of Flour Albus in Pregnant Women at Tamangapa Health Center in 2024

Vaginal Hygiene Behaviour	**p-*value***	**RR**	**CI 95%**
The application of cleansing products to female genitals.	0,350	0,149	0,003-8.048
Rinsing the genitals from front to back.	0,045	30,147	1.071-848.358
Wear loose underwear	0,200	0,415	0,108-1.593
Utilise undergarments that are not made of cotton.	0,048	17,329	1.029-291.802
Thoroughly clean the toilet seat before using it.	0,946	1,139	0,026-49.845
Use running water when cleansing the vagina.	0,171	2,794	0,642-12.154
Engage in daily bathing twice, once in the morning and once in the evening.	0,138	7,927	0,515-121.903
Pantyliner Use	0,155	3,587	0,617-20.866

Primary Data, 2024

DISCUSSION

This study indicates that the majority of mothers who attended Ante Natal Care experienced physiological vaginal discharge. This result is in line with previous research (2024) that obtained research results from 107 respondents. It was found that most experienced physiological fluor albus, namely 65 (61%) respondents (1). Meanwhile, other research (2023) showed the results of research that most experienced pathological flour albus, namely 74 (56.7%) respondents (6). In line with research (2024) which shows that of the 52 research respondents who experienced pathological flour albus, 26 respondents or half (50.0%) of the total number of respondents (16). Pathological flour albus is a symptom caused by an infection in the genitalia. Pathological fluor albus is characterized by a significant amount of discharge, sometimes causing spots on the underwear, thick liquid, yellowish white to grayish green in color, accompanied by itching and pain during urination, unpleasant odor, and irritation or redness in the vaginal area (17).

Based on the data found, the vaginal behavior of mothers who make the most visits is good, followed by moderate, and only a few with poor vaginal hygiene behavior (Table 2). In line with previous research findings that most pregnant women exhibit good vaginal hygiene behavior (1). In this study, the research results show the relationship between vaginal hygiene behavior and the incidence of *fluor albus* with *non-parametric* analysis using *the Mann-Whitney Test, a p- value of* 0.000 (<0.005) was found. It shows that there is a relationship between *vaginal hygiene behaviors* and the occurrence *of fluor albus* in pregnant women at the Tamangapa Community Health Center in 2024. This research is supported by research from 2024 which indicates that there is a link between personal hygiene behavior and the occurrence of fluor albus, resulting in a p-value of 0.001 (5). This is also in line with the 2023 which indicates that there is a significant relationship between behavior and the occurrence of vaginal discharge. (18).

Fluor albus is a common condition that women experience throughout their lives, from adolescence to menopause. Physiological fluor albus is characterized by the absence of pain, itching, and odorless transparent fluid. Pathological fluor albus can result from the infection of multiple microorganisms, including bacteria, fungi, and parasites (19). The amniotic membrane can be readily ruptured due to infections in the vagina and cervix. The growth of pathogenic bacteria or alterations in the normal flora of the vagina and cervix can result in ascending infections, which can be caused by inadequate hygiene practices." The amniotic membrane's function will be impaired by the presence of these infections, leading to a decrease in its strength and the inability to maintain the fetus in the uterus (20). One of the causes of premature membrane rupture in expectant women is infections, including chorioamnionitis, urinary tract infections, and sexually transmitted infections. *Chlamydia trachomatis, Trichomonas vaginalis,*

Candidiasis, Syphilis, Bacterial vaginosis, Neisseria gonorrhoeae, and Streptococcus Group B are among the genital infections that can result in premature membrane rupture (21).

Vaginal discharge can be caused by mistakes in maintaining the hygiene of the female organs. Bacteria and their growth can multiply rapidly in dirty and humid places, causing contamination that can lead to pathological vaginal discharge (22,23). Practicing good personal hygiene can reduce the risk of pathological flour albus (24). Ways to maintain genital hygiene include changing underwear at least twice a day, keeping the vagina clean, washing hands before touching it, wearing underwear made of cotton, cleaning the vagina after urinating with water, and not using chemical cleansers (24). The use of vaginal cleansers increases the risk of vaginal infections because these fluids can kill natural bacteria in the vagina and change the pH balance. Vaginal cleansers typically contain numerous chemicals that can harm the skin and disturb the vaginal ecosystem, particularly affecting pH and the presence of beneficial bacteria, potentially leading to fungal growth and itching around the genital area (5,23).

The behavior of washing genitalia from back to front is the most frequent behavior with occasional behavior carried out by 8 people (61.5%) of respondents. The vagina is anatomically located between the anus and urethra. Genitals that are cleaned from back to front can increase the risk of bacteria or other germs entering the vagina. The correct way to clean or wash the genitalia is from front to back to prevent germs from the anus do not enter the vagina, thus avoiding infection, inflammation, and itching. Research in 2019 shows that most pregnant women have performed perineal cleansing from front to back. Only a small percentage do it the wrong way, from back to front, which can lead to moving bacteria from the anus to the vagina. Thus, most mothers in the community have maintained proper perineal hygiene (25).

The behavior of drying the genitals after defecation or urination, most respondents have the behavior of never drying, namely 6 (46.2%) respondents. Drying the external genitals with a clean towel. Towels are a medium for transmitting bacteria, fungi, and parasites. Towels that have been contaminated with germs can cause these germs to cause infections in users. Regarding the use of tight underwear, most respondents sometimes use tight underwear, namely as many as 8 (61.5%) respondents. The use of tight underwear can cause the vagina to become moist and sweaty. High humidity makes the genital area hotter, which can lead to irritation and make it easier for bacteria to multiply (26).

Poor personal hygiene practices, like washing the genital area with unclean water and infrequently changing underwear, can lead to infections that cause diseases and facilitate the transmission of bacteria, viruses, and parasites responsible for sexually transmitted diseases into the genital area. The way to improve one's health is crucial by adopting good personal hygiene habits, as hygiene involves developing good habits to maintain one's own health (26)

A pantyliner is an absorbent material used for feminine hygiene in women's underwear. Using a pantyliner is one of the predisposing factors for leukorrhea because it can lead to an increase in temperature, humidity, and pH. This situation can increase the likelihood of the growth of germs and pathogenic fungi that cause leukorrhea. Research in 2021 shows a connection between using panty liners and the risk of abnormal vaginal discharge. The use of a pantyliner increases the risk of pathological leukorrhea by five times compared to those who do not use a pantyliner (27)

Hygiene behaviors are influenced by complex relationships among cultural norms, beliefs, and socioeconomic factors. Understanding these variables provides significant insights into health behaviors and disparities in health outcomes among communities. Cultural beliefs influence hygiene practices, especially in reproductive and maternal health. Women in patriarchal countries often face limited autonomy regarding their hygiene practices because of insufficient access to sanitation facilities. Income level has a significant impact on access to clean water, soap, and sanitation facilities. Women in resource-limited environments may resort to risky alternatives for menstrual hygiene products due to cost constraints (e.g., washcloths, newspapers), which can lead to infections and reproductive health complications. Income level has a significant impact on access to clean water, soap, and sanitation facilities.

This study emphasizes the importance of vaginal hygiene in pregnant women to reduce the incidence of fluor albus. Public health programs should include education on proper vaginal care within maternal health services, particularly in antenatal care (ANC) settings. Health professionals play a crucial role in raising awareness of the physiological changes during pregnancy and providing guidance on practices that enhance vaginal health. This could reduce infection rates and improve maternal health. This study underscores the importance of accessible hygiene

products and services for expectant mothers, especially in resource-limited areas where inadequate vaginal hygiene may be more common due to a lack of education or resources.

The findings of this study may not be able to be generalized to a larger population due to the sample size, which included only 52 pregnant women. Moreover, the cross-sectional design only provides a snapshot of the relationship between fluor albus and vaginal cleanliness, making it impossible to establish a causal relationship. Relying on self-reported data about hygiene habits may introduce bias, as individuals might exaggerate their adherence to recommended procedures. This is because the participants themselves provide the data. Considering a longitudinal approach for future research can provide a deeper understanding of the dynamics of vaginal hygiene practices over time and their impact on fluor albus occurrence. Additionally, future studies should consider other potential confounding factors like diet, socioeconomic status, and previous reproductive health issues.

Implications for Public Health

The study's findings can be utilized in public health policies and programs to enhance maternal health, especially through education on vaginal hygiene.

Effective implementation of vaginal hygiene interventions in resource-limited settings necessitates low-cost, sustainable techniques that are suitable for the local context.

The utilization of educational video media has proven effective in enhancing vulvar hygiene practices among adolescent girls. Research indicates that health education using video media can enhance adolescents' understanding and practices concerning feminine hygiene, hence aiding in preventing abnormal vaginal discharge.

Distribution of Basic Hygiene Kits: Providing basic hygiene kits containing essential items for reproductive hygiene can help adolescent girls adopt proper hygiene practices. Case studies demonstrate that the integration of education with vaginal hygiene kits effectively enhances adolescents' knowledge and behavior about the management of vaginal discharge.

Employment of Locally Sourced Natural Ingredients. In regions with restricted access to commercial hygiene products, employing locally sourced natural substances may serve as an alternative. The application of betel leaf decoction has demonstrated efficacy in addressing vaginal discharge in adolescents. This indicates that local resource-oriented initiatives may enhance reproductive health.

Enhancement of Knowledge via Formal and Informal Education. Enhancing adolescent girls' understanding of reproductive hygiene through formal teaching in schools and informal education within the community might facilitate the adoption of proper hygiene practices. Research indicates a correlation between awareness level and the behavior of adolescent girls in upholding vulvar hygiene. Therefore, a comprehensive educational campaign should be implemented to improve knowledge and promote hygienic practices.

Community-based education programs can be incorporated into maternal health services at healthcare centers, emphasizing proper hygiene practices such as cleaning methods, wearing cotton underwear, and avoiding harmful chemicals. Antenatal care standards can be revised to include regular evaluations of vaginal hygiene during appointments. Moreover, training healthcare providers to provide effective counseling on vaginal hygiene can aid in preventing pathological fluor albus. Government collaboration with the private sector can ensure the accessibility of safe and affordable hygiene products for pregnant women, particularly in areas with limited resources. This strategy can decrease the incidence of pathological fluor albus, improving maternal health and pregnancy outcomes.

CONCLUSION

There is a correlation between the incidence of fluor albus in pregnant women at the Tamangapa Health Centre and their vaginal hygiene. The majority of women, specifically 40%, have adequate vaginal hygiene, while the majority of women, specifically 62.9%, experience physiological fluor albus. This indicates that good vaginal hygiene causes the majority of physiological fluor albus, while poor vaginal hygiene causes pathological fluor albus.

Future research should increase the sample size and include diverse populations from various regions and socio-economic backgrounds to expand on the findings of this study. Examining specific types of vaginal hygiene practices, such as cleansing frequency, product types, and drying methods, can provide detailed insights into behaviors that may either mitigate or exacerbate fluor albus. Longitudinal studies may clarify the impact of changes in hygiene practices during pregnancy on the prevalence of vaginal infections. Studying the influence of education

and healthcare access on vaginal hygiene practices may help develop targeted public health interventions to reduce the incidence of fluor albus and improve pregnancy outcomes.

AUTHOR CONTRIBUSTION STATEMENT

Sartika conceptualized the research, conducted the data collection, performed the analysis, and wrote the draft of the manuscript. **Nadyah Haruna**, as the supervisor, provided critical direction and supervision throughout the research process, making significant contributions to the research design and interpretation of findings, and finalized the manuscript. **Dewi Setiawati**, as a supervisor, provided valuable support in refining the research methodology. **Rosdianah Rahim** reviewed the manuscript for important intellectual content, and **Fatmawaty**, as a supervisor, provided valuable support in refining the research methodology and reviewed the manuscript for important intellectual content. All authors read and approved the final manuscript.

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest in the preparation of this paper.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

The authors claim QuillBot and DeepL were employed only to improve text grammar, phrasing, and readability. All scientific concepts, study design, data analysis, and findings are the authors

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