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Original Article

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Barriers to access in maternity healthcare services during the postpartum period: a study in Khulna City, Bangladesh

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ABSTRACT

Aims: The main objectives of this study were to identify barriers to accessing maternity healthcare services during the postpartum period.

Methods: This study was conducted by following a quantitative research design, and a survey method was employed. Data were collected from 232 respondents by using multistage stratified random sampling. The respondents were women who gave birth to at least one child during the last year. Data were analyzed by using IBM SPSS Statistics v25.0.

Results: The findings of this study reveal that the majority of the respondents were deprived of basic maternity care. They faced different sorts of barriers, such as individual barriers (lack of education and awareness, occupation); interpersonal barriers (lack of social and economic support from the family); community level barriers (impact of religious beliefs/decision making capacity on postpartum maternity care); institution-level barriers (lack of sufficient infrastructure and service delivery of the healthcare centre); policy level barriers (lack of the implementation of proper policy). Tukey HSD post hoc analysis indicated a significant difference only between households with heads having 1-5 years and 6-12 years of education (mean difference=-0.304, p=.006). There were no significant differences across the other education groups (all p>.05).

Conclusion: The government should focus on strengthening the maternity health care system and raising awareness among women and the household head in slum areas. Additionally, interventions, instead of broad education-based policies, should be targeted at the lower educated households.

Keywords: Barriers, women, healthcare, coping strategies, postpartum

INTRODUCTION

Postpartum care is essential for both the mother and the newborn baby to ensure their health and well-being. Nevertheless, in many parts of the world, postpartum care is either inadequate or absent. Lack of proper postpartum care can be the cause of very serious complications, which can be life-threatening, including maternal mortality, infant mortality, mental health challenges, physical health issues, and long-term effects on physical and mental health. Here, maternal mortality is one of the most severe outcomes of inadequate postpartum care. According to the World Health Organization, most maternal deaths occur within the first six weeks after childbirth.[1] Generally, the postpartum period lasts about 6 weeks (42 days) after childbirth.[2] The reproductive age range of Bangladeshi women is generally considered between 15 and 49 years. This period represents the age range when Bangladeshi women are biologically capable of bearing children.[3-5] In addition, women who have recently given birth to a child have experienced current maternity healthcare access and barriers, and they can capture experiences with healthcare systems, policies, and societal changes that are still in place, which helped the researcher identify contemporary issues rather than outdated ones. Mothers are at risk during this period of developing infections, postpartum hemorrhage, and other life-threatening conditions. Among them, postpartum hemorrhage remains a notable cause of maternal mortality worldwide.[6] Poor women with limited access to maternity healthcare services face tremendous barriers in Bangladesh.[7]

Postpartum checkups are essential for monitoring signs of infection and providing early treatment.[8] They may also sometimes experience chronic health problems.[9] Mental health is one of them. It is also a crucial issue during the postpartum period. Lack of adequate care during this period can exacerbate some serious mental health issues, leading to conditions such as anxiety, sadness, fatigue, postpartum depression, and, in some severe cases, postpartum psychosis.[10] The absence of adequate care during the postpartum period also has significant complications for the newborn child. Inadequate care during this critical period can lead to a

higher risk of infant mortality as well as malnutrition and developmental delays in newborns. The neonatal period is the most vulnerable period for newborns, and the lack of postpartum care leads to excessive infant mortality.[11] Mothers who do not receive proper postpartum care may experience struggles with the transition to parenthood. This can have long-term effects on family cohesion and child-rearing practices.[12]

Since Sustainable Development Goal (SDG) 3 aims to ensure good health and well-being at all ages, which includes two of the most important targets: reducing maternal mortality and ensuring universal access to reproductive healthcare and family planning, among the 21 targets of the SDGs.[13] People who live in slum areas frequently experience inadequate access to postpartum care, such as women who visit a minimum of four times for antenatal care in a hospital but have a minor visit to take postnatal care after childbirth.[14] Therefore, the objectives of this study were to identify barriers to access to maternity healthcare services during the postpartum period.

This study can make several noteworthy contributions. First, this study will assist in formulating national policies to address the barriers to access to maternal health care services during the postpartum period. Second, it creates opportunities for further research by deepening the understanding of these barriers. Third, as certain strategies have been identified to mitigate these barriers, the study can inform the development of interventions. After the intervention's development and implementation, the slum dwellers' mothers will benefit locally by gaining access to maternal health care. Finally, this study may inform policies toward SDG 3.

Theoretical Framework

This study adopts the Socio-ecological Model (SEM) to identify the barriers slum-dwelling mothers face in accessing maternity healthcare services during the postpartum period. Bronfenbrenner introduced the socio-ecological model in 1970.[15] However, it was later developed to promote health-related behavioral changes.[16]

The SEM model shows how multi-level barriers affect access to postpartum healthcare services. Based on this model, at the individual level, factors such as education and occupation shape healthcare utilization. At the interpersonal level, a lack of family support and financial constraints of the family significantly impact women's access to postpartum healthcare. At the community level, reliance on traditional healing practices and religious practices is identified as an obstacle. At the institutional level, inadequate healthcare facilities, a shortage of skilled providers, and a lack of essential medical equipment are notable barriers. At the policy level, weak policy implementation is a significant barrier.

METHODS

Ethics

This study was conducted with the approval of the Ethics Committee of the Researches and Innovation Center at Khulna University (Date: 12.03.2025, Decision No: KUECC-2025-03-24). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. Written informed consent was obtained from all individual participants prior to their inclusion in the study.

Research Design

This study employed a quantitative research design. Because a quantitative approach enables systematic measurement of variables and facilitates statistical analysis to determine their relative significance, it also provides empirical evidence that enhances the validity of the findings.[17] The nature of this study was explanatory. Explanatory research primarily focuses on understanding the underlying causes and relationships among variables. It aims to provide deeper insights into how or why certain phenomena occur.[18] This study was conducted using the survey method because it is the most common quantitative research method. It involves structured questions presented to respondents in various formats, such as questionnaires and interviews, depending on research goals and available resources.[19]

Study Settings

The study has been conducted in four slum areas under the Khulna City Corporation. Reasons include that slum populations often experience higher rates of maternal and infant mortality compared to other urban and rural areas. Poor access to antenatal care, inadequate healthcare infrastructure, and insufficient skilled birth attendance contribute to these outcomes. Slum areas often lack access to sufficient healthcare facilities, which makes it difficult for women to receive maternal care.[20] Therefore, the research has been conducted in four informal settlements (Bastuhara Colony Slum, Hafiz Nagar Slum, Rupsha Slum, Railway Slum) to fulfill the research aim and objectives. The details of the study settings are given in **Table 1**.

Table 1. Study settings

SI no	Name of slums	Locations
1	Bastuhara colony slum	Ward No. 09, Khulna City Corporation
2	Rail-crossing slum	Ward No. 10, Khulna City Corporation
3	Railway Slum	Ward No. 21, Khulna City Corporation
4	Rupsha Slum	Ward No. 22, Khulna City Corporation

SI no: Serial number

Participants of the Study

The primary entity being studied or analyzed in research is known as the unit of analysis. The choice of unit of analysis determines the level of retractation of the research and influences the kind of data collected and the conclusions drawn.[21] The primary unit of analysis in this study is as follows, based on some inclusion and exclusion criteria. Women who gave birth to at least one baby during the last year, who are 15 to 49 years old, and who live in four selected slum areas were the participants of the study. The women who do not belong to the above characteristics were excluded from this study.

Sampling Procedure

A multistage stratified random sampling procedure has been used to achieve a representative sample. The sampling procedure initially included Khulna district from the 64 districts of Bangladesh. Then, four slum areas were selected

from Khulna city. Based on the household census, the population size was 582. From these, 232 individuals were selected using a statistically appropriate sample size. The sample was distributed proportionally among the wards based on population size to ensure fair representation and reduce sampling bias.

Sample Size Determination

To determine the actual sample size, the following formula by Cochran was used.

$$SS = \frac{Z^2 xP(1-p)}{C^2}$$

Calculation for the finite sample size in this study

$$SS_1 = \frac{SS}{1 + \frac{SS-1}{P}}$$

$$= \frac{384.16}{1 + \frac{384.16 - 1}{582}}$$

$$= \frac{384.16}{1 + 0.658}$$

$$= \frac{384.16}{1.658}$$

$$= 231.70$$

$$= 232$$

Probability calculation for each ward, formula (**Table 2**)

$$\frac{\text{Total population of the ward}}{\text{Total population of the study}} \times \text{sample size}$$

Table 2. Calculated sample size

Sl no	Location	Number of people in stratum	Sample size
1	Ward no 9	n=88	n=35
2	Ward no 10	n=130	n=52
3	Ward no 21	n=188	n=75
4	Ward no 22	n=176	n=70
		Total population=582	Total sample=232

Source: Household census, 2025. SI no:Serial number

Data Collection

Data have been collected according to precise instructions. The fieldwork was conducted from 5 to 14 April 2025. In this study, despite using the survey method, a semi-structured interview schedule with both open-ended and closed-ended questions was used instead of a questionnaire because the study involved lower-educated mothers living in slum areas. If the researchers had not conducted face-to-face interviews, the participants would not have been able to answer the questionnaire properly. That is why the researchers chose an interview schedule instead of a questionnaire. The interview schedule was developed based on the study objectives and consisted of three modules. The first module covered socio-demographic information of the respondents; the second addressed barriers to accessing maternal health care during the postpartum period; and the third focused on their adaptive strategies. Data were measured by using nominal and interval scales. The informants were assured the highest confidentiality of the information they provided. Anonymity was maintained to avoid disclosing informants' identities. During data collection, the informants were not forced to participate in the study, and the researcher sought to build rapport with them.

Explanatory Variable

Based on Bronfenbrenner's Socio-ecological Model, the explanatory variables were categorized into five categories. Individual factors such as education (illiterate/primary/secondary/tertiary), occupation (housewife/maid/day laborer/fish cutter/tailor). Interpersonal factors, including status of receiving social support (yes/no), from whom receiving the social support (family/neighbor/husband), the effectiveness of support (excellent/good/neutral/poor/very poor), and status of facing economic hardship from family (yes/no). Community level barriers, such as the impact of religious beliefs/decision-making capacity on postpartum maternity care (yes/no), taking a strategy as an alternative (cope with the situation/take permission from the household head/go outside to maintain purdah). Institution-level barriers regarding sufficiency of infrastructure and service delivery of the healthcare center (strongly disagree/disagree/neutral/agree/strongly agree).

Statistical Analysis

The collected data have been analyzed using IBM SPSS Statistics v25.0. Data were measured by using nominal and interval scales. Mainly, two sections were followed in variable measurement. Firstly, univariate (mean, median, frequency, percentage). In the second section, we used bivariate analysis (Chi-square test).

RESULTS

Table 3 displays the socio-demographic data of the study participants. A majority of the participants were between 25 and 31 years old. In the study group, 21.1% were illiterate, 37.5% had completed primary education, and 41.4% had secondary education. None of the respondents was tertiary educated. Additionally, most respondents (59.9%) were housewives. Regarding the number of children, 42.2% had one child. Concerning childbirth methods, a significant 61.6% of women had cesarean deliveries, while 38.4% experienced vaginal deliveries. Most of the respondents' monthly family income was within 21.500 BDT.

The **Table 4** shows that, in terms of social support during the postpartum period, 55.2% of women got social support, while 44.8% of women did not get social support. Approximately

Table 3. Socio-demographic information of the participants and individual barriers regarding health care access

Name of the variables	Characteristics			Frequency (n)	Percent (%)
Age	Categories	Adolescence	<18	17	7.3
		Young adulthood	18-24	81	34.9
		Mature adulthood	25-31	92	39.7
		Mature adulthood	>31	42	18.1
Religion		Islam		190	81.9
		Sanatan		42	18.1
Marital status		Married		231	99.6
		Divorced		1	0.4
Educational qualification	Categories	Illiterate	0	49	21.1
		Primary	1-5	87	37.5
		Secondary	6-12	96	41.4
		Tertiary	Bachelor's	0	0
Occupation		Housewife		139	59.9
		Maid		28	12.1
		Day labor		22	9.5
		Fish cutter		21	9.1
		Tailor		22	9.5
Number of children	Categories	Only one child		98	42.2
		Two children		71	30.6
		More than two children		63	27.2
Type of delivery		Normal		89	38.4
		Caesarian		143	61.6
Total monthly income of the family	Range	Lower	1-12500	82	35.3
		Lower middle	12501-21500	128	55.2
		Lower middle	>21501	22	9.5

14% received social support from their family, 10% from husband, and 21.5% from the neighbor. In addition, in terms of the effectiveness of this support, 9.9% rated their spousal support as excellent, 33.2% rated it as good in nature, and 33.2% remained neutral. However, about 17 percent rated their husband's support as poor in nature, while (n=17) 7.3% rated it as very poor in nature or absent of support. This table also reported that most of the respondents faced economic hardship from family which negatively affected their healthcare access.

Table 4. Interpersonal barriers regarding social and economic support from family during postpartum period

Name of variables	Categories	Frequency (n)	Percent (%)
Status of receiving social support during postpartum period	Yes	128	55.2
	No	104	44.8
Sources of receiving social support	From family	41	13.2
	From neighbor	34	10.1
	From husband	53	21.5
Status of receiving social support from husband			
	Yes	147	63.4
	No	85	36.6
Effectiveness of this support	Excellent	23	9.9
	Good	77	33.2
	Neutral	77	33.2
	Poor	38	16.4
	Very poor	17	7.3
Status of facing economic hardship from family	Yes	133	57.3
	No	99	42.7

Table 5 explores the impact of religious beliefs on assessing postpartum maternity care. In this outlook, 24.1% acknowledged that their religious convictions impacted their ability in healthcare utilization. As alternative strategies to manage the situation, (3.9%) women argued that they did not take any alternative without a self-endurance strategy. Where (11.2%) women sought permission from their household head to go outside, and (9.5%) women strictly adhered to their purdah to go outside, aligning a system of coping mechanisms. A majority (54.3%) of the respondents disclosed that decision-making capacity create impact on taking postpartum maternity care. As the alternative strategies to manage these difficulties, a majority of the respondents sought permission from their spouse, and the rest of the respondents either took permission from the household head or convinced them. In most of the cases, the decision-making regarding maternal health care was taken by their husband.

Table 6 shows that, in terms of the availability of healthcare professionals at the nearest healthcare center, only 27.6% of women agreed, but none strongly agreed. Additionally, only 18.1% and 12.5% of mothers agreed and strongly agreed, respectively, regarding the support and understanding capacity of healthcare providers. On the other hand, the majority strongly disagreed about the healthcare providers' ability to identify immediate problems. Concerning their behavior, 28.4% disagreed, while 30.6% of women were neutral. Only 16.4% agreed and 12.1% strongly agreed. Regarding the sufficiency of healthcare providers, 18.5% disagreed, 29.3% were neutral, only 36.2% agreed, and 15.9% strongly agreed. Regarding the sufficiency of necessary

Table 5. Community-level barriers and adaptive resilience of postpartum women in healthcare utilization

Name of the variables	Categories	Frequency (n)	Percent (%)
Impact of religious beliefs on postpartum maternity care	Yes	56	24.1
	No	176	75.9
Taking a strategy as an alternative	Cope with the situation	9	3.9
	Taking permission from household head	26	11.2
	Go outside with maintaining purdah	22	9.5
Impact of decision-making capacity to take postpartum maternity care	Yes	126	54.3
	No	106	45.7
Taking strategy as alternative	Cope up with the situation	36	14.9
	Taking permission from household head	51	22.0
	Try to convince the household head	39	17.4
Role of decision-making	Husband	149	64.2
	Father-in-law	61	26.3
	Mother-in-law	22	9.5

equipment at the healthcare center, 9.1% of women strongly disagreed, 25.9% disagreed, and 34.1% were neutral. Only 18.5% agreed, and 12.5% strongly agreed.

Table 7 depicts the distribution of monthly treatment costs varied by the educational qualification of the household head. A majority of the respondents in the 501-1000 treatment cost group were among households with heads with 6-12 years of education (n=52), while those with 1-5 years of education were mainly in the 1-500 cost grouping (n=49). Treatment costs of 1001-1500 were reported by only a small number of respondents in all education groups. In general, the results indicate that the relatively higher treatment expenditures were associated with higher educational attainment of the household head, which is supported by the significant ANOVA results.

The one-way ANOVA in Table 8 indicated that the years of schooling of the household head were significantly associated with the total cost of treatment, F (3.228)=4.475, p=.004.

Tukey HSD post hoc analysis (Table 9) indicated a significant difference only between households with heads having 1-5 years and 6-12 years of education (mean difference=-0.304, p=.006). There were no significant differences across the other

Table 7. Crosstabulation on educational qualification of the household and the total cost of treatment in a month

Count					
		Total cost of treatment in a month			Total
		1-500	501-1000	1001-1500	
Educational qualification of the household	0	27	24	2	53
	1-5	49	26	4	79
	6-12	36	52	10	98
	14	2	0	0	2
Total		114	102	16	232

Table 8. One-way ANOVA and Tukey HSD post hoc analysis of total cost of treatment by educational qualification of the household head

Source	SS	df	MS	F	p	Interpretation
Between groups	4.927	3	1.642	4.475	.004	Significant
Within groups	83.677	228	0.367			
Total	88.603	231				

ANOVA: Analysis of variance, HSD: Honestly significant difference, SS: Sum of squares, MS: Mean square

Table 9. Tukey HSD post hoc comparisons

Comparison	Mean difference	95% CI	p	Significant
0 vs 1-5	0.098	-0.18 to 0.38	.799	No
0 vs 6-12	-0.206	-0.47 to 0.06	.192	No
0 vs 14	0.528	-0.60 to 1.66	.621	No
1-5 vs 6-12	-0.304	-0.54 to -0.07	.006	Yes
1-5 vs 14	0.430	-0.69 to 1.55	.754	No
6-12 vs 14	0.735	-0.39 to 1.85	.327	No

HSD: Honestly significant difference, CI: Confidence interval

education groups (all p>.05). The study findings showed that the treatment costs were significantly different depending on the educational attainment of the head of the household, and that the significant difference was mainly between the 1-5 years and 6-12 years education groups.

DISCUSSION

In this study, respondents faced various barriers, which are discussed below in the context of Bronfenbrenner's Socio-ecological Model.[15]

Individual Level

The findings of this study revealed a statistically significant relationship between educational attainment and postpartum healthcare utilization (p=0.006). This highlights the

Table 6. Institutional barriers regarding infrastructure and service delivery of the healthcare center

Situation of the caregiving center	Responses									
	1		2		3		4		5	
	n	p (%)	n	p (%)	n	p (%)	n	p (%)	n	p (%)
Doctors and nurses are available at your nearest healthcare center	22	9.5	75	32.3	71	30.6	64	27.6	None	
Healthcare providers are supportive and understanding	20	8.6	66	28.4	75	32.3	42	18.1	29	12.5
Healthcare providers can easily identify the health problems	45	19.4	79	34.1	69	29.7	39	16.8	None	
The behavior of healthcare providers is satisfactory	29	12.5	66	28.4	71	30.6	38	16.4	28	12.1
Healthcare providers are sufficient in number	None		43	18.5	68	29.3	84	36.2	37	15.9
The necessary equipment is sufficient in healthcare center	21	9.1	60	25.9	79	34.1	43	18.5	29	12.5

Code: 1) strongly disagree 2) disagree 3) neutral 4) agree 5) strongly agree

important role of informational awareness in influencing postpartum healthcare-seeking behavior at the interpersonal level. Additionally, most of the respondents were illiterate or primary educated. None of the respondents was tertiary educated. Moreover, the majority (57.8%) did not access any postpartum care despite experiencing physical complications during the postpartum period, indicating a lack of motivation among women to seek maternity healthcare services during this time. This result aligns with previous studies, which found that educated women are more likely to pursue maternal services due to better health literacy, gender autonomy, and financial decision-making capacity.[22] Furthermore, female education plays a vital role in shaping maternal and child health outcomes,[23] and because of the lack of motivation, many mothers did not see postpartum visits as necessary unless complications arose.[24]

Interpersonal Level

This study highlights major socio-economic barriers that hinder women's access to maternity healthcare during the postpartum period. A significant number (44.8%) reported a lack of social support, emphasizing ongoing gaps in postpartum care networks. Decision-making autonomy was also a key barrier for women seeking postpartum care. Additionally, economic hardship was widespread, affecting 57.3% of women. During financial struggles, nutritional deficiencies were common, with most women indicating that financial constraints (72.8%) and large household sizes (10.8%) were the main obstacles, revealing interpersonal vulnerabilities in postpartum healthcare use. These results align with earlier research indicating that emotional and practical support after childbirth greatly increases women's engagement with healthcare services, especially in resource-limited settings.[25] However, many husbands do not prioritize postpartum care, financial support, or follow-up visits.[26] Additionally, religious norms discourage women from visiting male-dominated or mixed-gender health facilities.[27,28]

Community Level

The study's findings identified several demographic factors that hinder participants' access to maternity healthcare. The average distance was about 2 miles, with travel time approximately 40 minutes, reflecting the perceived availability of community healthcare centers. Most participants rated this poorly, indicating a link between limited community healthcare services and barriers to postpartum healthcare utilization. Additionally, people in the slum community were not aware of maternal healthcare services. Moreover, in the slum community, religious beliefs were shown to have a clear impact on healthcare use, with 24.1% citing that their faith in purdah prevented access to maternity services during this time. These findings are similar to those of other studies, which have highlighted the importance of community-level support in reducing emotional distress and encouraging uptake.[26] Other studies also highlight that community and religious norms often influence healthcare utilization.[26-28]

Institutional Level

The current study found a statistically significant link between satisfactory behavior among healthcare professionals and postpartum healthcare utilization (p=.031). This indicates that the interpersonal and communication skills of healthcare providers are crucial for encouraging service use at the institutional level. Additionally, there was a marginally significant association between the adequacy of medical equipment and healthcare service utilization (p = 0.078). A highly significant relationship was also observed between quality of care and postpartum healthcare utilization (p=.001), which aligns with the institutional findings. Respondents reported receiving inadequate care from healthcare providers. A shortage of skilled professionals was also a key factor. This aligns with other studies that found a lack of quality services to be a barrier to accessing maternity health care services.[7,29,30]

Policy Level

The aim of the National Health Policy 2011 was to ensure universal access to primary healthcare, including maternal and child health services. However, findings from this study indicate that, despite the high incidence of complications, only 42.7% of the participants sought formal medical assistance, while a larger portion (57.3%) managed the health issues without accessing postpartum maternity care. Further, the findings of this study also revealed that 58.2% of women suffer from postpartum maternal health issues, while only 7.8% utilize professional healthcare. Moreover, the aim of the Digital Health Strategy of Bangladesh 2021 was to use ICT to improve access to and the quality of healthcare. But this study found that among the participants, (21.1%) were illiterate, (37.5%) were primary educated, and (41.4%) were secondary level educated. A majority of the participants were primarily educated and weren't aware of postpartum maternity healthcare utilization. In addition, the years of schooling of the household head were significantly associated with the total cost of treatment, F (3.228)=4.475, p=.004. Furthermore, significant differences were only seen between the 1-5 years and 6-12 years education groups; interventions, instead of broad education-based policies, should be targeted at the least educated households. These findings align with other studies that have found that Bangladesh has national maternal health policies; they are frequently poorly enforced.[31] Additional years of schooling significantly improve household welfare, particularly among poorer households, where the marginal returns to education are greatest.[32]

Limitations

This study has some limitations. The cross-sectional design restricts detailed interpretation. In addition, since the study was only conducted in Khulna city and only included those respondents who had given birth within the last year, it may not fully represent all slum-dwelling mothers in Bangladesh.

CONCLUSION

In this study, mothers living in slums faced various barriers at the individual, interpersonal, community, institutional, and policy levels. The findings of this study have several policy implications. First, to overcome these barriers, the government needs to implement the National Health Policy 2011 and the Digital Health Strategy of Bangladesh 2021. Second, interventions should focus on strengthening the health system, promoting women's independence in

accessing healthcare, providing economic support, and increasing health education and awareness among women in slum areas. Third, this study may inform policies toward SDG 3 by 2030 to promote maternal health and well-being during the postpartum period in slum communities. Finally, significant differences were only seen between the 1-5 years and 6-12 years education groups; interventions, instead of broad education-based policies, should be targeted at the least educated households.

ETHICAL DECLARATIONS

Ethics Committee Approval

This study was conducted with the approval of the Ethics Committee of the Researches and Innovation Center at Khulna University (Date: 12.03.2025, Decision No: KUECC-2025-03-24).

Informed Consent

Written informed consent was obtained from all individual participants prior to their inclusion in the study. Participants were fully informed about the study's aims, procedures, potential risks and benefits, and their rights-including the right to withdraw at any time without consequence. All participants voluntarily signed a written informed consent form.

Peer Review Process

This manuscript was subject to external peer review.

Conflict of Interest

The authors declare no conflicts of interest related to this study.

Financial Disclosure

The authors received no financial support for the conduct or publication of this research.

Author Contributions

Concept: MHM; Design: MHM; Data Collection and Entry: MHM; Literature Search: MHM; Writing Draft: MHM; Supervising: ERD; Writing: ERD; Critical Review: ERD.

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Scientific reliability of YouTube videos on postnatal care: a systematic evaluation of content quality

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ABSTRACT

Aims: To evaluate the scientific reliability, educational quality, and usefulness of the most-viewed YouTube videos related to postnatal care.

Methods: This cross-sectional content analysis included the 100 most-viewed English-language YouTube videos identified using the keywords "postnatal care," "postpartum care," "postpartum recovery," "new mother care," "maternal postpartum health," and "postnatal support." Video characteristics were recorded, including duration, views, likes, comments, and uploader type. Scientific reliability, educational quality, and content usefulness were assessed using the DISCERN instrument, the Global Quality Scale (GQS), and a structured usefulness score based on international postpartum care recommendations, respectively.

Results: The mean video duration was 8.9±5.4 minutes, and the mean number of views was 587.421±1.243.865. Healthcare professionals and healthcare institutions accounted for 60% of all videos. The mean DISCERN score was 46.7±12.4, indicating moderate scientific reliability, while the mean GQS score was 3.6±1.1. Only 9% of videos were classified as excellent according to DISCERN criteria. Breastfeeding support (86%), maternal recovery (79%), and newborn care (71%) were the most frequently addressed topics, whereas family planning (28%), postpartum warning signs (31%), and maternal mental health (42%) were less commonly discussed. Longer video duration and the presence of scientific references were independently associated with higher DISCERN scores.

Conclusion: The quality and scientific reliability of YouTube videos on postnatal care are heterogeneous. Although content produced by healthcare professionals and healthcare institutions is of higher quality, several important postpartum topics remain insufficiently covered. Increasing the availability of evidence-based educational content may improve maternal health literacy and support informed decision-making.

Keywords: Postnatal care, postpartum care, YouTube, health information, DISCERN, maternal health

INTRODUCTION

The postpartum period is a critical stage for maternal and infant health, during which women require accurate information regarding physical recovery, breastfeeding, newborn care, mental health, and family planning. Adequate postnatal care has been associated with improved maternal well-being and reduced postpartum complications.[1-3] However, many women report unmet informational needs during this period and increasingly seek health-related information through online platforms.[4]

YouTube has become one of the most widely used sources of health information worldwide because it is readily accessible and supports visual learning.[5] Although the platform offers extensive educational content, the scientific accuracy and reliability of health-related videos vary considerably because videos are not routinely subject to peer review or professional oversight.[6] Previous studies evaluating YouTube content across various medical fields have reported substantial deficiencies in quality, reliability, and completeness of information.[7-9]

Despite the growing popularity of online resources among postpartum women, limited evidence exists regarding the quality and scientific reliability of YouTube videos specifically addressing postnatal care. Therefore, this study aimed to evaluate the reliability, educational quality, and usefulness of the most-viewed YouTube videos on postnatal care using validated assessment tools.

METHODS

Ethics

This study analyzed only publicly accessible videos available on YouTube and did not involve human participants, patient records, identifiable personal information, or direct interaction with individuals. Therefore, consistent with international research ethics principles and the methods used in previous YouTube-based studies, ethical approval and informed consent were not required. The study utilized publicly available data and posed no risk to individuals whose content was analyzed.

Study Design

This cross-sectional content analysis was conducted to evaluate the scientific reliability, educational quality, and informational value of YouTube videos related to postnatal care. The study focused on publicly available videos and aimed to assess the extent to which these videos provide evidence-based information regarding maternal postpartum care. The methodology was based on previously published studies evaluating health information on YouTube and was adapted specifically for postpartum health education.

Search Strategy and Video Selection

A systematic YouTube search was conducted on June 15, 2026, using the English-language keywords "postnatal care," "postpartum care," "postpartum recovery," "new mother care," "maternal postpartum health," and "postnatal support."[10] To minimize the influence of personalized recommendations, all searches were conducted in incognito mode using a newly created browser profile with no prior browsing history, stored cookies, or user account activity. The searches were conducted from Ankara, Turkiye, and the geographic location was kept constant throughout the search process.

Videos retrieved from all search terms were ranked according to the number of views, and the 100 most-viewed eligible videos were included in the final analysis. Duplicate videos were identified and removed. When identical content was uploaded by multiple channels, only the version with the highest view count was retained.

Videos were eligible if they were in English, focused primarily on maternal postnatal care, contained audiovisual educational content, were publicly accessible, and were at least one minute in duration. Videos consisting solely of personal experiences, promotional advertisements, or entertainment content, as well as duplicate uploads and videos with poor audiovisual quality, were excluded.

Data Extraction

For each included video, the extracted variables are summarized in **Table 1**, including video characteristics, uploader classification, and educational content components.

Table 1. Variables extracted from included YouTube videos

Category	Variables extracted
Video characteristics	Video duration (minutes), upload date, number of views, number of likes, number of comments, video age (days since upload), healthcare professional involvement
Uploader classification	Healthcare professionals (physicians, nurses, midwives, lactation consultants), hospitals, universities or healthcare institutions, governmental or non-governmental organizations, commercial health-related channels, individual users or patient-experience channels
Educational content components	Physical recovery after childbirth, breastfeeding support, maternal nutrition, postpartum warning signs, mental health, physical activity recommendations, family planning, newborn care, healthcare follow-up recommendations

DISCERN Assessment

The scientific reliability and quality of treatment-related information were evaluated using the DISCERN instrument, a validated tool developed to assess consumer health information regarding treatment choices. The DISCERN instrument consists of 16 items divided into three domains: reliability of information, quality of treatment-related information, and overall quality assessment.

Each item is scored on a five-point Likert scale ranging from 1 (criterion not met) to 5 (criterion completely met), yielding a total score ranging from 16 to 80. Based on previously published classifications, videos were categorized as very poor (16-26 points), poor (27-38 points), fair (39-50 points), good (51-62 points), or excellent (63-80 points). Higher scores indicate greater scientific reliability and higher-quality educational content.[11,12]

Global Quality Scale (GQS)

Overall educational quality was assessed using the GQS, a widely used five-point instrument for evaluating online health information resources. The GQS evaluates the overall flow, comprehensiveness, ease of understanding, and usefulness of information from the perspective of a general viewer.

Videos with scores of 1 or 2 were classified as low quality, those with a score of 3 as moderate quality, and those with scores of 4 or 5 as high quality. Higher GQS scores reflect greater educational value and better-quality information delivery.[13,14]

Usefulness Score

A modified usefulness scoring system was developed based on recommendations from the World Health Organization, the American College of Obstetricians and Gynecologists, and contemporary postpartum care guidelines.[15,16]

Twelve key educational components were evaluated:

- Definition and objectives of postnatal care
- Maternal physical recovery
- Perineal or cesarean wound care
- Breastfeeding support
- Maternal nutrition
- Postpartum warning signs
- Mental health and postpartum depression
- Physical activity recommendations
- Family planning and contraception
- Postpartum follow-up visits
- Newborn care
- Social and family support

One point was awarded for each component adequately addressed in a video. The total usefulness score ranged from

0 to 12. Videos were classified as having poor usefulness (0-3 points), moderate usefulness (4-7 points), or high usefulness (8-12 points).

Interobserver Reliability

All videos were independently assessed by two researchers experienced in maternal and child health. Before the formal evaluation, a pilot assessment of ten randomly selected videos was performed to standardize scoring procedures and ensure consistency between reviewers.

Interobserver agreement was assessed using the intraclass correlation coefficient (ICC) for continuous scores and weighted Cohen's kappa for categorical classifications. Values above 0.80 were considered indicative of excellent agreement.[17]

Statistical Analysis

The data were performed using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean±standard deviation or median (minimum-maximum), depending on data distribution. Categorical variables were presented as frequencies and percentages.

Normality was assessed using the Shapiro-Wilk test. Two-group comparisons were performed using the independent-samples t test or the Mann-Whitney U test, whereas comparisons among more than two groups were performed using one-way analysis of variance (ANOVA) or the Kruskal-Wallis test. Categorical variables were compared using the Chi-square test or Fisher's exact test where appropriate.

Pearson and Spearman correlation analyses were used, as appropriate, to evaluate associations between video characteristics and quality scores. Multiple linear regression analyses were performed to identify independent predictors of higher DISCERN and GQS scores. Statistical significance was defined as a two-tailed p-value <0.05.

RESULTS

A total of 100 YouTube videos related to postnatal care met the predefined eligibility criteria and were included in the final analysis. The mean video duration was 8.9±5.4 minutes, with a median duration of 7.4 minutes. The mean numbers of views and likes were 587.421±1.243.865 and 7.845±18.234, respectively. The median number of views was 148.230, reflecting a highly skewed distribution characterized by a limited number of highly popular videos. The mean video age was 5.2±2.8 years (Table 2).

Table 2. General characteristics of included videos (n=100)

Variable	Mean±SD	Median	Min-max
Video duration (minutes)	8.9±5.4	7.4	1.3-34.7
Views	587.421±1.243.865	148.230	5.812-8.942.335
Likes	7.845±18.234	2.140	34-122.418
Comments	423±812	115	0-5.628
Video age (years)	5.2±2.8	4.8	1-14

SD: Standard deviation, Min: Minimum, Max: Maximum

Distribution of Video Sources

Among the analyzed videos, healthcare professionals constituted the largest uploader group (34%), followed by hospitals and healthcare institutions (26%). Governmental and non-governmental organizations accounted for 18% of the videos, whereas commercial channels and individual users accounted for 12% and 10%, respectively (Table 3). The proportional distribution of uploader categories is illustrated in Figure 1.

Table 3. Distribution of videos according to uploader source

Source	n (%)
Healthcare professionals	34 (34.0)
Hospitals/healthcare institutions	26 (26.0)
Governmental/NGO organizations	18 (18.0)
Commercial health channels	12 (12.0)
Individual users	10 (10.0)

NGO: Non-governmental organization

Figure 1. Distribution of uploader sources
NGO: Non-governmental organization

Most videos (60%) originated from healthcare professionals or healthcare institutions, suggesting that expert-generated content remains the dominant source of postnatal care information on YouTube.

Scientific Reliability and Educational Quality

The mean DISCERN score was 46.7±12.4, corresponding to a moderate level of overall scientific reliability. Based on the DISCERN classification, 37% of the videos were categorized as fair quality, whereas only 9% were rated as excellent. Conversely, 30% of videos were classified as poor or very poor (Table 4).

Table 4. DISCERN quality classification

Category	Score range	n (%)
Very poor	16-26	12 (12.0)
Poor	27-38	18 (18.0)
Fair	39-50	37 (37.0)
Good	51-62	24 (24.0)
Excellent	63-80	9 (9.0)

The distribution of DISCERN quality categories is presented in Figure 2.

GQS evaluation revealed a mean score of 3.6±1.1. Nearly half of all videos (46%) were classified as high-quality educational resources, whereas 16% were considered low quality (Table 5).

The mean usefulness score was 6.4±2.5. Most videos were classified as having moderate usefulness (52%), whereas only 29% were classified as having high usefulness (Table 6).

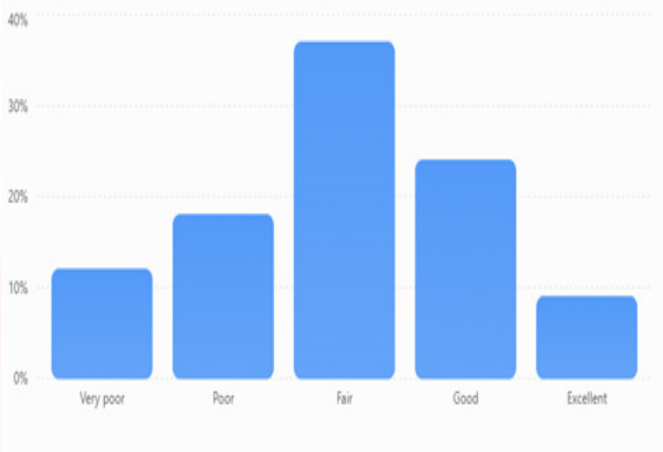

Figure 2. DISCERN quality classification of included videos

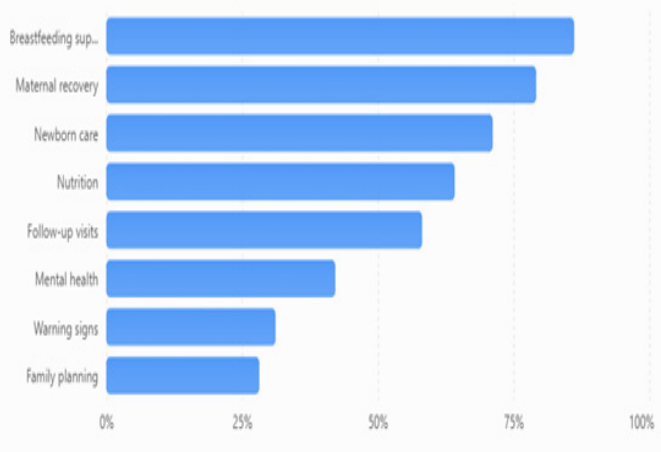

Figure 3. Frequency of postnatal care topics covered in YouTube videos

Table 5. GQS distribution

GQS category	Score	n (%)
Low quality	1-2	16 (16.0)
Moderate quality	3	38 (38.0)
High quality	4-5	46 (46.0)

GQS: Global Quality Scale

Table 6. Usefulness classification

Usefulness category	Score range	n (%)
Poor usefulness	0-3	19 (19.0)
Moderate usefulness	4-7	52 (52.0)
High usefulness	8-12	29 (29.0)

Content Analysis

The frequency with which key postnatal care topics were addressed varied considerably across videos. Breastfeeding support (86%), maternal physical recovery (79%), newborn care (71%), and nutritional recommendations (64%) were the most frequently discussed subjects. In contrast, postpartum warning signs requiring medical evaluation (31%), family planning (28%), and postpartum mental health issues (42%) were substantially underrepresented (**Table 7**).

Table 7. Content components included in videos

Content component	n (%)
Breastfeeding support	86 (86.0)
Maternal physical recovery	79 (79.0)
Newborn care	71 (71.0)
Maternal nutrition	64 (64.0)
Follow-up visits	58 (58.0)
Mental health/postpartum depression	42 (42.0)
Warning signs requiring medical attention	31 (31.0)
Family planning/contraception	28 (28.0)

The relative frequency of educational content domains is illustrated in **Figure 3**.

These findings indicate that practical infant-feeding and recovery topics receive substantial attention, whereas long-term maternal health issues and preventive counseling are frequently neglected.

Comparison According to Uploader Type

Significant differences were observed between uploader categories. Videos produced by healthcare professionals had the highest DISCERN, GQS, and usefulness scores, whereas videos uploaded by individual users had the lowest scores across all quality measures (**Table 8**).

Table 8. Quality scores according to uploader type

Uploader type	DISCERN mean±SD	GQS mean±SD	Usefulness mean±SD
Healthcare professionals	54.2±10.1	4.3±0.7	8.2±1.9
Hospitals/institutions	50.1±9.8	4.0±0.8	7.5±2.0
Governmental/NGO	48.6±8.7	3.9±0.8	7.1±1.8
Commercial channels	38.4±10.3	3.1±0.9	5.2±2.1
Individual users	31.8±8.7	2.4±0.8	3.9±1.7

ANOVA $p<0.001$ for all comparisons. SD: Standard deviation, GQS: Global Quality Scale, NGO: Non-governmental organization, ANOVA: Analysis of variance

Interobserver agreement was excellent, with an ICC of 0.89 (95% CI: 0.84-0.93) for DISCERN scores and a weighted kappa coefficient of 0.86 for GQS classifications.

Correlation and Regression Analyses

Correlation analysis demonstrated moderate positive associations between video duration and quality indicators. Longer video duration was associated with higher DISCERN ($r=0.48$, $p<0.001$), GQS ($r=0.41$, $p<0.001$), and usefulness scores ($r=0.45$, $p<0.001$) (**Table 9**).

Table 9. Correlation analysis between video characteristics and quality scores

Variable	DISCERN (r)	GQS (r)	Usefulness (r)
Video duration	0.48***	0.41***	0.45***
Views	0.24*	0.21*	0.18
Likes	0.36**	0.29**	0.31**
Comments	0.09	0.07	0.05

* $p<0.05$ ** $p<0.01$ *** $p<0.001$ GQS: Global Quality Scale

The positive association between video duration and DISCERN score is illustrated in **Figure 4**.

Multiple linear regression analysis demonstrated that healthcare professional involvement ($\beta=0.42$, $p<0.001$), longer video duration ($\beta=0.29$, $p=0.004$), and citation of scientific

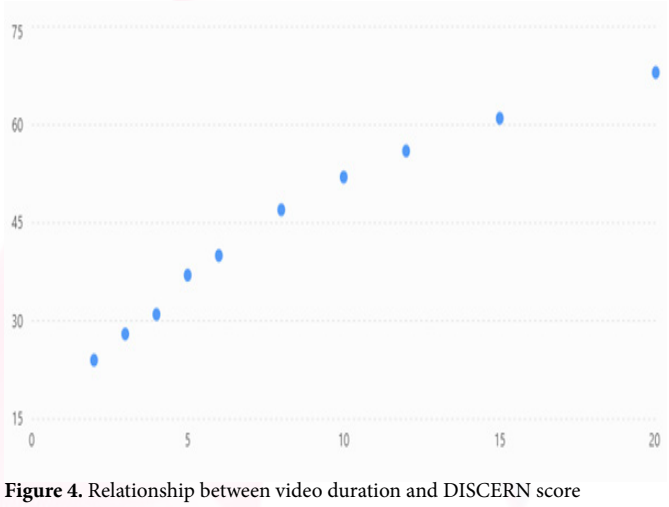

Figure 4. Relationship between video duration and DISCERN score

references (β=0.33, p=0.001) were independent predictors of higher DISCERN scores (**Table 10**).

Table 10. Multiple linear regression analysis for predictors of DISCERN score

Variable	β	95% CI	p
Healthcare professional source	0.42	0.26-0.58	<0.001
Video duration	0.29	0.09-0.49	0.004
Presence of references	0.33	0.14-0.52	0.001
Number of views	0.08	-0.03-0.19	0.164

Model R^2=0.41. CI: Confidence interval

Overall, although many videos provided useful introductory information on postnatal care, substantial deficiencies were identified in the citation of scientific references, coverage of maternal health topics, and discussion of postpartum complications. Videos produced by healthcare professionals consistently had higher educational quality and reliability than those from non-professional sources.

DISCUSSION

The present study evaluated the scientific reliability, educational quality, and usefulness of the most-viewed YouTube videos related to postnatal care. Although YouTube has become an increasingly popular source of maternal health information, our findings indicate that the quality and reliability of available content remain variable. The mean GQS score indicated moderate educational quality, whereas the mean DISCERN score indicated only moderate scientific reliability, highlighting the discrepancy between the accessibility and quality of online health information.

The growing reliance on digital platforms for seeking postpartum information has been well documented. Women frequently report unmet educational needs regarding physical recovery, breastfeeding, infant care, contraception, and emotional well-being during the postpartum period.[3,4] Consequently, many mothers seek information through internet-based resources before consulting healthcare professionals.[5,6] The present findings suggest that although YouTube may partially address these informational needs, the scientific quality of the available content is inconsistent and may not adequately support evidence-based decision-making.

A key finding of this study was that videos produced by healthcare professionals and healthcare institutions had significantly higher DISCERN, GQS, and usefulness scores than those uploaded by commercial channels or individual users. Similar observations have been reported across multiple medical and health education topics.[7-9,14] Professional involvement likely contributes to greater adherence to clinical guidelines, more balanced presentation of benefits and risks, and improved educational structure. These findings support the importance of encouraging healthcare organizations to actively participate in digital health communication.

The content analysis revealed considerable variation in the coverage of essential postnatal care topics. Breastfeeding support, maternal recovery, and newborn care were the most frequently addressed subjects. In contrast, postpartum warning signs, family planning, and maternal mental health were considerably underrepresented. This finding is particularly noteworthy because current WHO and ACOG recommendations emphasize comprehensive postpartum care that extends beyond immediate physical recovery and includes mental health assessment, contraceptive counseling, and recognition of potentially life-threatening maternal complications.[15,16] The limited attention given to these topics may contribute to persistent knowledge gaps among postpartum women.

Another notable finding was the positive association between video duration and quality scores. Longer video duration was significantly associated with higher DISCERN, GQS, and usefulness scores. Similar relationships have been observed in previous evaluations of YouTube health information, where longer content was associated with greater comprehensiveness and educational value.[8,13] Nevertheless, video duration alone should not be interpreted as a surrogate marker of quality, as some lengthy videos may still provide incomplete or inaccurate information.

Interestingly, viewer engagement metrics demonstrated limited utility in identifying high-quality content. Although the number of likes showed weak-to-moderate correlations with quality indicators, view counts were not independent predictors of DISCERN scores. This finding supports previous evidence indicating that popularity does not necessarily reflect scientific accuracy.[7,8] Videos may achieve high viewership because of presentation style, emotional appeal, or algorithmic promotion rather than evidence-based content. Therefore, postpartum women who rely solely on popularity metrics may be exposed to information of variable quality.

These findings have several important practical implications. Given the widespread use of YouTube as a source of maternal health information, healthcare professionals, hospitals, professional societies, and public health organizations should consider developing high-quality educational content that addresses underrepresented areas such as postpartum depression, contraceptive counseling, and recognition

of warning signs requiring urgent medical evaluation. Increasing the availability and visibility of evidence-based content may improve maternal health literacy and support informed decision-making during the postpartum period.

Clinicians may also incorporate evidence-based digital resources into routine postpartum counseling by directing mothers to verified, high-quality YouTube channels or other reliable online educational resources during discharge planning and postpartum follow-up visits.

This study has several strengths. First, it evaluated the most-viewed YouTube videos related to postnatal care, thereby focusing on the content most likely to be encountered by users. Second, the use of validated assessment instruments, including DISCERN and GQS, enabled a standardized evaluation of scientific reliability and educational quality. Third, the inclusion of a structured usefulness score based on internationally recognized postpartum care recommendations allowed for a broader assessment of the educational content.

Limitations

Several limitations should also be acknowledged. First, only English-language videos were included, limiting the generalizability of the findings to other languages and cultural contexts. Second, YouTube is a dynamic platform in which video rankings, view counts, and available content continuously change; therefore, the results represent a cross-sectional assessment at a single time point. Third, despite the use of validated tools, some degree of subjective interpretation is unavoidable in video evaluation studies. Fourth, only the most-viewed videos were analyzed, potentially excluding less popular but highly accurate educational resources. Finally, this study assessed the quality of information presented within videos but did not evaluate users' comprehension, behavioral changes, or health outcomes resulting from exposure to the content.

CONCLUSION

As a result, YouTube provides an easily accessible source of information regarding postnatal care; however, the scientific reliability and educational quality of available videos remain heterogeneous. Healthcare professional-generated content demonstrates superior quality compared with non-professional sources, yet important topics such as maternal mental health, family planning, and postpartum warning signs remain insufficiently addressed. Future efforts should focus on increasing the production and dissemination of evidence-based postpartum educational content to improve maternal health literacy and support safe postpartum care practices.

ETHICAL DECLARATIONS

Ethics Committee Approval

This study analyzed only videos publicly available on YouTube and did not involve human participants, patient records, personal data containing identifying information, or direct interaction with individuals. Therefore, ethical approval was not required.

Informed Consent

Since this study did not involve human participants, personally identifiable information, or human biological material, informed consent was not required.

Peer Review Process

This manuscript was subject to external peer review.

Conflict of Interest

The authors declare no conflicts of interest related to this study.

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Author Contributions

Concept: MS, İF, HA, DAB; Design: MS, İF, HA, DAB; Control: MS, İF, HA, DAB; Data Collection and/or Processing: MS, İF, HA, DAB; Analysis and/or Interpretation: MS, İF, HA, DAB; Literature Review: MS, İF, HA, DAB; Article Writing: MS, İF, HA, DAB; Critical Review: All Authors.

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Global research trends in baby-led weaning: a bibliometric and visualized knowledge mapping study

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ABSTRACT

Aims: This study aimed to evaluate the global research landscape of baby-led weaning (BLW) through bibliometric and visualized knowledge mapping analyses.

Methods: A bibliometric search was performed in the Web of Science (WoS) Core Collection on June 20, 2026. Publications that have been identified with the help of the keywords "baby-led weaning" OR "baby led weaning" have been taken into account regardless of their publication date, language, and types of documents. Various bibliometric measures such as publications number, citations number, productive authors, journals, countries, and keywords have been analyzed.

Results: The total number of documents that were published between 1980 and 2026 amounted to 189. The scientific production rose sharply since 2011, with its peak reached in 2023. Original articles made up the biggest percentage of all publications (67.2%). The Nutrients journal produced the greatest number of works, while the most cited document was the work of Brown & Lee on satiety responsiveness and weaning practice. The most productive countries in BLW studies were the United Kingdom, the United States, and New Zealand. Co-occurrence of keywords analysis identified four main thematic areas of research: complementary feeding and infant nutrition; feeding behavior and self-regulation; breast feeding; choking risk. Recent studies have increasingly paid attention to nutrition, adequacy, growth, obesity, and developmental effects.

Conclusion: Research on BLW has grown significantly in the last decade, shifting from descriptive studies to nutrition, behavior, and health outcomes. Further studies should enhance international collaboration and include data from diverse cultural and economic backgrounds.

Keywords: Baby-led weaning, bibliometric analysis, feeding behavior, knowledge mapping

INTRODUCTION

Breast milk weaning to complementary feeding is an important aspect of baby nutrition that affects not only baby's growth but also eating habits and health status in the future. It is recommended to start complementary feeding at about 6 months old together with breast milk.[1,2] Usually, complementary feeding is carried out using spoon-feeding by caregiver; however, there are other ways of doing this.

Baby-led weaning (BLW) is a feeding practice in which the child is given the chance to self-feed properly prepared family foods starting with the introduction of complementary food.[3] This strategy is known to aid children in developing independence and the ability to recognize cues for hunger and fullness, as well as the formation of healthy eating habits.[4]

Even though there are many investigations and systematic reviews that assess the possible positive and negative impact of BLW regarding growth, adequate nutrition, food acceptance, and the risk of choking, the literature is rather heterogeneous.[5-7] On the other hand, the number of articles related to BLW has greatly increased during the last ten years.

Even with increasing research, there has been no comprehensive assessment of the development process of the BLW research, key contributors to BLW research, collaboration activities and thematic aspects within this research area. Bibliometric analysis provides a means of quantitative measurement in understanding the development process and structure of knowledge within a particular science discipline. This paper sought to explore the publication trend, influential authors, core journals, collaborative activities and research hotspots within the BLW field.

METHODS

Ethics

This research has only been conducted using public bibliographic sources and has not used human subjects, patient information, biological materials, or any personal information. Ethical approval and consent from human subjects were not necessary for conducting this study.

Study Design

The current work has been performed based on bibliometric and scientometric analysis in order to perform an overall assessment of development, intellectual structure, and recent research trends in scientific literature of BLW. The use of bibliometric tools offers a numerical way to examine scientific production, citation, cooperation, and themes in the scientific area. In addition to the traditional bibliometric indicators, the visualization method was used to investigate connections between the authors, organizations, countries, citations, and keywords.

Data Source

Web of Science (WoS) Core Collection database was chosen as the only bibliographic data source. WoS is considered to be one of the largest and best databases for bibliometric analysis as it indexes the journals of the highest quality in various fields of science and contains necessary citation data. It enables users to extract full bibliographic information and citations, thus making it possible to conduct network analysis and study citation connections within the research field.[8]

Search Strategy and Data Collection

A systematic literature search was performed in the WoS Core Collection on June 20, 2026. To identify publications specifically focusing on baby-led weaning, the Topic Search (TS) function was utilized. The following search query was applied: TS=("baby-led weaning" OR "baby led weaning"). The search strategy was intentionally limited to the terms "baby-led weaning" and "baby led weaning" because these are the most widely accepted and specific terms describing the BLW approach. Broader feeding-related terms were not included, as they may retrieve publications that are not directly related to the BLW concept, thereby reducing the specificity of the bibliometric analysis.

Topic Search searches for those articles that contain the specified keywords in the titles, abstracts, author keywords and Keywords Plus. There were no limitations set on the date, language, country, field of study or document type when conducting the first search in order to ensure the breadth of the dataset.

As a result of the search, 189 publications were identified. All retrieved records, including the earliest publications, were manually reviewed for relevance and confirmed to be directly related to the BLW concept. The search strategy was highly specific to the research topic; therefore, all retrieved publications met the eligibility criteria and were included in the bibliometric analysis. No duplicate records were identified in the exported dataset. Thus, the final dataset consisted of 189 publications.

Statistical Analysis

The entire dataset of citations was exported to a plain text file format from Web of Science. Information that had been captured in the process included publication title, name of the author(s), year of publication, journal title, affiliation, country of origin, abstract, author keywords, Keywords Plus, cited references, citation numbers, document type, funding details, and source journal.

The records were then processed before any analysis could be done. Minor issues such as differences in spelling of author names, affiliation, and keywords were corrected to improve the reliability of network visualization and bibliometric analysis.

Descriptive statistical analyses were performed using IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, NY, USA), and science mapping analyses and network visualizations were performed using ChatGPT.

Bibliometric Indicators

A few bibliometric parameters were employed to assess the scientific productivity and impact of BLW literature. These include the following:

- Annual publication output
- Annual citation trends
- Most productive authors
- Most influential authors based on citation counts
- Leading journals publishing BLW-related research
- Most productive institutions
- Most productive countries
- Most highly cited publications
- Most frequently cited references

Productivity in publication was gauged by the number of publications, while impact in science was measured by citations using citation-based parameters. Citations were directly retrieved from the WoS database.

Science Mapping Analysis

To analyze the intellectual and social structure of the field, a number of science mapping tools were used.

Co-authorship Analysis

Co-authorship analysis was conducted in order to analyze the co-authorship network of researchers, their affiliations and countries. It provided an opportunity to visualize the research collaborations and influential participants in the research of BLW.

Co-citation Analysis

Co-citation analysis was used to identify the basic studies and knowledge bases, which defined the development of the BLW research. Citations of articles together made them intellectually related and formed thematic clusters.

Bibliographic Coupling

Bibliographic coupling analysis was conducted to identify current research themes and thematic similarities among papers. Papers with common citations were regarded as thematically similar and clustered.

Keyword Co-occurrence Analysis

Keyword co-occurrence analysis was conducted using author keywords and indexed keywords. Frequently co-occurring terms were mapped to identify major research themes, research hotspots, and emerging topics within the field. The analysis also provided insights into the thematic evolution of BLW research over time.

Visualization Procedures

Network maps were generated for:

- Author collaboration networks
- Institutional collaboration networks
- Country collaboration networks
- Co-citation networks
- Bibliographic coupling networks
- Keyword co-occurrence networks

In the resulting maps, the nodes were bibliometric entities (such as authors, institutions, countries, references, or keywords), and the links were the relations between nodes. The larger the node, the more important was it, while the thicker the link between two nodes, the stronger the relation between them. To measure the strength of a relation, the Total Link Strength (TLS) was utilized.

RESULTS

A total of 189 publications on BLW were retrieved from the WoS Core Collection. The publications covered the period between 1980 and 2026. The total number of citations was 3115, with a mean citation count of 16.48 citations per publication.

Publication Trends

In relation to the annual publication volume, a small number of articles were seen to be produced before the year 2010. A significant rise is witnessed after 2011 and this reflects the growing interest in BLW. The largest annual volume of publications was reported for the year 2023, where 21 articles were published, followed by 2025, where 19 publications were reported, 2022, where 18 articles were published, and 2024, where 17 articles were published (**Figure 1**).

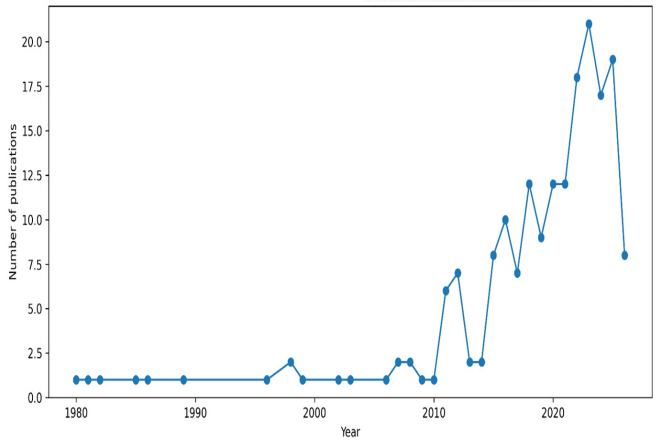

Figure 1. Annual publication output on baby-led weaning

Document Types

Most documents were primary research articles. Out of the total 189 references, 127 articles and 26 reviews were found. Meeting abstracts, editorials, letters, book reviews, and other forms of literature made up a smaller portion of the dataset. This indicates that this field largely depends on research work, with a relatively increasing number of synthesis articles (**Table 1**).

Table 1. Distribution of document types

Document type	n
Article	127
Review	26
Meeting abstract	13
Editorial material	10
Book review	3
Letter	2
News item	2
Other	6

Leading Journals

The most productive journal was Nutrients with 17 publications, followed by Appetite with 12 publications and Maternal and Child Nutrition with 10 publications. Although BMJ Open published only five records, it accumulated 382 citations, indicating a strong citation impact. Similarly, Maternal and Child Nutrition produced 10 papers and received 382 citations (**Table 2**, **Figure 2**).

Table 2. Most productive journals

Journal	Publications	Citations
Nutrients	17	341
Appetite	12	207
Maternal and Child Nutrition	10	382
Journal of Human Nutrition and Dietetics	7	143
BMJ Open	5	382
Children-Basel	5	38
Nutrition Bulletin	4	63
Journal of Pediatric Nursing	4	13
Archives of Disease in Childhood	3	94
Revista Paulista de Pediatria	3	42

BMJ: British Medical Journal

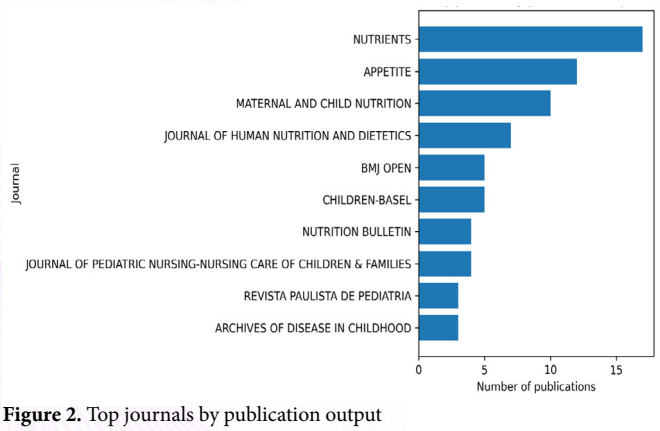

Figure 2. Top journals by publication output

Most Cited Publications

The most cited publication was "Early influences on child satiety-responsiveness: the role of weaning style" by Brown and Lee,[3] published in Pediatric Obesity in 2015, with 128

citations. The second most cited study was the randomized clinical trial by Taylor et al.[6] in JAMA Pediatrics in 2017, with 123 citations. Other highly cited publications focused on maternal feeding practices, infant growth, food preferences, choking risk, and feasibility of BLW (**Table 3**).

Table 3. Most cited publications

Rank	Title	Source	Year	Citations
1	Early influences on child satiety-responsiveness: the role of weaning style[3]	Pediatric Obesity	2015	128
2	Effect of a baby-led approach to complementary feeding on infant growth and overweight[6]	JAMA Pediatrics	2017	123
3	A descriptive study investigating the use and nature of baby-led weaning in a UK sample of mothers[9]	Maternal and Child Nutrition	2011	111
4	Baby knows best? The impact of weaning style on food preferences and body-mass index[21]	BMJ Open	2012	101
5	How feasible is baby-led weaning as an approach to infant feeding?[10]	Nutrients	2012	93
6	Healthcare professionals' and mothers' knowledge of, attitudes to and experiences with baby-led weaning[22]	BMJ Open	2012	89
7	Baby-led introduction to solids (BLISS) study[23]	BMC Pediatrics	2015	89
8	How different are baby-led weaning and conventional complementary feeding?[19]	BMJ Open	2016	89
9	Baby-led weaning: what a systematic review of the literature adds on[5]	Italian Journal of Pediatrics	2018	79
10	Weaning of infants[24]	Archives of Disease in Childhood	2003	73

JAMA: Journal of the American Medical Association, UK: United Kingdom, BMJ: British Medical Journal

Productive Authors

The most productive authors were Taylor RW and Heath ALM, each with 21 publications. They were followed by Daniels L with 14 publications, Haszard JJ with 13 publications, and Fleming EA with 12 publications. These findings indicate that BLW research is strongly shaped by a relatively concentrated group of researchers, particularly from New Zealand-based infant nutrition research networks (**Table 4**).

Country Contributions

The United Kingdom was the leading contributing country with 39 publications, followed by the United States with 24 publications and New Zealand with 21 publications. Spain and Italy each contributed 16 publications. These findings show that BLW research has been mainly produced in high-income countries, especially English-speaking research environments (**Table 5**, **Figure 3**).

Keyword Analysis and Research Themes

The most frequent author keyword was "complementary feeding" with 87 occurrences, followed by "baby-led weaning" with 76 occurrences and "weaning" with 31 occurrences. Other frequent terms included "infants," "infant nutrition," "breastfeeding," "choking," "infant feeding," "obesity," and "feeding behavior" (**Table 6**).

Table 4. Most productive authors

Author	Publications
Taylor RW	21
Heath ALM	21
Daniels L	14
Haszard JJ	13
Fleming EA	12
Brown A	10
Wheeler BJ	8
Bialek-Dratwa A	8
Conlon CA	7
Beck KL	7

Table 5. Most productive countries

Country	Publications
United Kingdom	39
United States	24
New Zealand	21
Spain	16
Italy	16
Poland	10
Brazil	8
Portugal	6
Canada	6
Australia	6

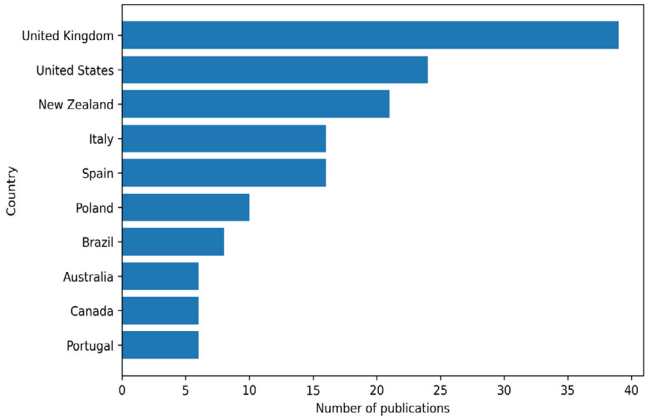

Figure 3. Top contributing countries

The keyword structure suggests that the field is organized around four major thematic areas: complementary feeding practices, infant nutritional adequacy, feeding behavior and self-regulation, and safety concerns such as choking. The presence of terms such as "obesity," "neophobia," "growth," and "energy intake" indicates that recent research has moved beyond describing BLW practices and increasingly examines developmental, nutritional, and behavioral outcomes.

Figure 4 shows the keyword co-occurrence network created using the author's keywords. Four clusters have been found. While the biggest one was based on complementary feeding and baby nutrition, other clusters covered breast feeding practices, baby feeding behaviors, development outcomes,

Table 6. Most frequent keywords

Keyword	Frequency
Complementary feeding	87
Baby-led weaning	76
Weaning	31
Infants	16
Infant nutrition	14
Infant	13
Breastfeeding	13
Choking	9
Infant feeding	9
BLW	7
Knowledge	6
Nutrition	6
Child nutrition	6
Obesity	6
Neophobia	5

BLW: Baby-led weaning

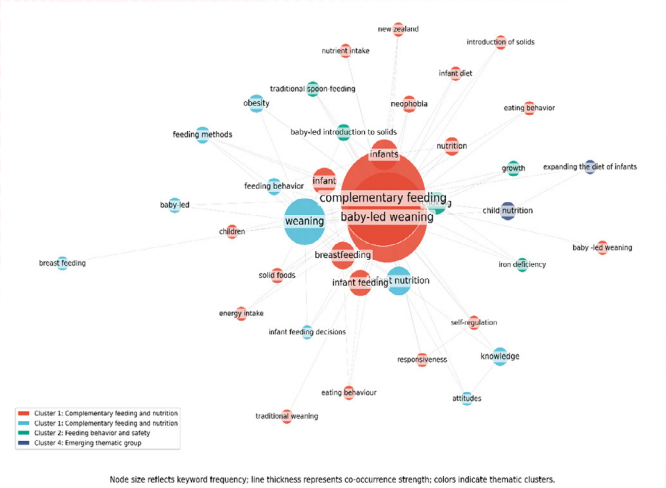

Figure 4. Keyword co-occurrence network of baby-led weaning research

and issues related to baby safety such as choking. The key role played by "baby-led weaning" and "complementary feeding" in the conceptual structure of the field is shown by their centrality.

Overall Interpretation

The bibliometric analysis of the literature on BLW reveals a fast-growing but fairly narrow-spectrum of studies. The earlier works were few, whereas the surge since 2011 can be explained by the rising interest in alternative forms of complementary feeding from the scientific and medical communities. The most significant research papers dealt with feeding methods, satiety responses, food preferences, infant development, choking hazards, and perspectives of mothers and professionals. Given the domination of studies conducted in the UK, New Zealand, and the US, further research is required in other parts of the world.

DISCUSSION

This work represents the first bibliometric analysis of the global scientific literature in the context of BLW. During the analysis of 189 papers indexed in the WoS Core Collection, it was possible to determine publication trends, influential authors, journals, collaborations, and main themes, which contributed to the development of BLW studies. As a result, it is possible to note that there is an increasing interest in BLW among the scientific community in recent years, and that the development of this area moved from descriptive studies to outcome research.

Among the most significant discoveries was the considerable growth of the number of publications since 2011. While the notion of self-feeding of infants existed before, BLW has received international attention due to the emergence of groundbreaking research works by Brown and Lee[9] that described the experiences of mothers, practices of feeding, and eating habits of infants using this method.[4] The constant growth of publications since 2015 is associated with growing professional interest towards responsive feeding practices and growing public attention to alternative feeding methods for infants. This pattern has been revealed in other emergent spheres of pediatric nutrition where parental practices are also studied.[2]

This acceleration reflects not merely the publication of a new study but the field's first empirical and operational definition. Brown and Lee's[9] 2011 descriptive study was among the first to systematically characterize BLW alongside mothers' actual feeding practices, providing subsequent researchers with a shared conceptual framework and terminology. The emergence of this standard definition allowed a previously scattered, case-based literature to develop into comparable and replicable research questions. Furthermore, although the WHO's guiding principles on responsive complementary feeding, published in 2003, had already laid the conceptual groundwork, it was only after 2011 that these principles became concretely linked to baby-led feeding practice through empirical research.[1,9] Accordingly, 2011 can be interpreted as a threshold at which a theoretical foundation was translated into clinical and behavioral research.

The dominance of primary studies in literature implies that BLW is still an evolving field in which evidence continues to be generated. The lower proportion of review studies means that although more evidence is being developed in BLW, there are still chances to conduct evidence synthesis or meta-analysis studies in the field. This finding is in line with earlier systematic reviews that identified the scarcity of high-quality randomized controlled trials in BLW research as well as methodological heterogeneity in this area.[5,10]

The journal analysis showed that Nutrients, Appetite, and Maternal and Child Nutrition are the top journals for publications. Nutrients, Appetite, and Maternal and Child Nutrition journals have been known to be significant platforms for publishing research on infant nutrition, feeding practices, and infant exposure to diets. It was surprising to see how BMJ Open had shown high citation rates despite having fewer publications, implying that some BLW studies have been published in general and accessible multidisciplinary journals.[11]

The citation analysis identified studies by Brown and Lee[9] and the BLISS trial conducted by Taylor and colleagues as the intellectual foundations of the field. Brown and Lee's[9] work substantially contributed to understanding parental feeding practices, satiety responsiveness, and infant autonomy during complementary feeding.[3] Similarly, the BLISS randomized controlled trial represented an important milestone because it addressed concerns regarding growth, nutritional adequacy, and safety through a more rigorous study design.[6] The prominence of these studies in the citation network suggests that contemporary BLW research continues to build upon questions related to self-regulation, food acceptance, and nutritional outcomes.

The country-based analysis has shown that the UK, the USA, and New Zealand are the most productive countries. This is not surprising, because many pioneering BLW studies come from research teams based in those countries.[3,6,9] Furthermore, the healthcare system in these countries has increasingly focused on responsive feeding and family-based nutrition counseling, which could help increase the interest of academics in baby-led feeding strategies. Still, low productivity of the countries with developing economies is an indication of a critical lack of literature. The feeding styles depend heavily on culture, economic environment, food supply, and the healthcare system; hence, research conclusions drawn from the experience of rich countries cannot necessarily be applied universally.[12-16]

The dominance of these three countries is most plausibly linked to the field's foundational research infrastructure. Brown and Lee's[9] UK-based descriptive study and the BLISS randomized controlled trial conducted by Taylor and colleagues[6] in New Zealand became reference points that shaped the methodological standards of BLW research. Conducting a large-scale, multi-year RCT such as BLISS requires substantial academic funding and pediatric nutrition research infrastructure, which helps explain why such studies remain concentrated in a limited number of high-income countries. Moreover, the early adoption of responsive feeding approaches within the healthcare systems of these countries allowed academic interest to grow alongside clinical practice. The predominance of English-language databases such as WoS may further reinforce this pattern, since studies conducted in other languages may be underrepresented in bibliometric visibility. This pattern should therefore be considered not only a matter of research capacity but also one of publication and language bias.

The keyword co-occurrence analysis provides valuable insight into the thematic evolution of BLW research. The prominence of terms such as "complementary feeding," "infant nutrition," "breastfeeding," and "infant feeding" indicates that BLW research remains closely integrated with broader discussions regarding infant nutrition. At the same time, keywords including "obesity," "food preferences," "self-regulation," and "choking" suggest a growing emphasis on evaluating the long-term consequences and safety of infant-led feeding approaches. Earlier studies largely focused on describing parental experiences and feeding practices, whereas more recent investigations have increasingly explored developmental outcomes, eating behaviors, nutrient intake, and growth trajectories.[7,17]

However, the appearance of choking-related terms is especially relevant. The problem of choking has become one of the most frequently debated issues concerning BLW since its inception. Nevertheless, at present there is no suggesting that, provided that proper food choices are made and safe feeding techniques are used, BLW would increase the risk of choking compared to the conventional complementary feeding techniques.[7,10] In addition, the issue of nutrition adequacy-specifically iron intake and energy expenditure-is becoming increasingly investigated.[6,17-20]

Based on the collaboration networks observed in this study, BLW studies seem to be centered in quite interconnected academic communities. Although such concentration of BLW researchers might ensure methodological conformity and accumulation of knowledge, international collaboration would bring additional diversification into future research findings. Collaboration between researchers in different cultural and socio-economic settings could prove beneficial in terms of assessing implementation of BLW on an international level and verifying the advantages associated with BLW.

These findings point to several priorities for advancing BLW research. First, replicating RCT designs similar to BLISS across diverse socioeconomic and cultural contexts is critical to testing the generalizability of current findings.[6] Second, although Brown and Lee's[9] work on satiety-responsiveness provided early evidence of BLW's effects on infant appetite regulation, long-term follow-up studies are still needed to determine whether these effects persist into childhood and adolescence.[4] Third, updating the WHO's complementary feeding guiding principles offers an opportunity to establish a standardized definition of BLW for research and intervention purposes, which could reduce methodological heterogeneity across studies.[1] Finally, international collaborations that include researchers from low- and middle-income countries should be prioritized, both to test cultural applicability and to reduce the geographic and country-based publication inequities observed in this field.

Limitations

Various limitations should be considered when interpreting the findings of this study. First, although exploratory searches using the same search strategy were also performed in PubMed and Scopus and yielded largely overlapping records with only a limited number of additional publications, the bibliometric analysis was conducted exclusively using the WoS Core Collection. Therefore, publications indexed only in other databases may not have been captured, which should be considered when interpreting the findings. Secondly, citation numbers are dynamic and are subject to change due to the publication of new publications. Thirdly, bibliometrics measures scientific productivity and impact but not the methodology or clinical relevance of articles. Fourthly, the differences in terms used could affect some network analysis despite the standardization of the dataset.

CONCLUSION

To conclude, the body of knowledge on BLW has seen considerable development in the last ten years and developed into a broad research area involving multiple disciplines

including nutrition, feeding behaviors, developmental aspects, and child health. It appears from the results that in the future, research on BLW will shift from descriptive studies towards assessment of the efficacy, safety, and effects of infant-led complementary feeding practices on child health.

ETHICAL DECLARATIONS

Ethics Committee Approval

This research was conducted using only publicly available bibliographic sources and did not involve human subjects, patient information, biological materials, or any personal information. Ethical approval was not required for the conduct of this study.

Informed Consent

Since this study is a bibliometric study, informed consent is not required.

Peer Review Process

This manuscript was subject to external peer review.

Conflict of Interest

The authors declare no conflicts of interest related to this study.

Financial Disclosure

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Author Contributions

Concept and Design: AET, DYT; Data Collection: AET, DYT; Data Analysis and Interpretation: AET, DYT; Drafting of the Manuscript: AET; Critical Revision of the Manuscript: DYT; Final Approval of the Manuscript: AET, DYT.

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Selected obesity-related dietary behaviours, body-mass index, and depressive symptoms among university students: a cross-sectional study

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ABSTRACT

Aims: This study aimed to examine the associations between selected obesity-related dietary behaviours and body-mass index (BMI) and to investigate the association between BMI and depressive symptoms among university students.

Methods: This cross-sectional study was conducted among 632 university students aged 18-24 years in Turkiye. Data were collected using a structured questionnaire assessing sociodemographic characteristics, dietary behaviours, physical activity, and screen time. Depressive symptoms were evaluated using the Patient Health Questionnaire-9 (PHQ-9). Participants were classified according to the World Health Organization (WHO) BMI criteria. Logistic and linear regression analyses were performed.

Results: Higher dietary behaviour scores were associated with lower odds of belonging to the increased BMI category (OR=0.91, p<0.001), whereas higher caloric intake from sugar-sweetened beverages was associated with increased BMI (OR=1.02, p<0.001). Physical activity level was significantly associated with BMI (p=0.010). No significant association was found between BMI and fruit consumption, vegetable consumption, or screen time. BMI was significantly associated with depressive symptoms (β=0.15, p=0.004).

Conclusion: Selected obesity-related dietary behaviours, sugar-sweetened beverage consumption, and lower physical activity levels were associated with higher BMI among university students. Furthermore, higher BMI was associated with greater depressive symptoms. These findings highlight the importance of integrated interventions targeting both healthy lifestyle behaviours and mental well-being in young adults.

Keywords: Obesity, physical activity, mental health, sugar-sweetened beverages, young adults

INTRODUCTION

Obesity has become one of the most significant public health challenges worldwide, with its prevalence increasing rapidly across all age groups. According to recent global estimates, more than one billion people are currently living with overweight or obesity, and this number continues to rise, particularly among adolescents and young adults.[1,2] This growing epidemic is associated with a substantial burden of non-communicable diseases, including cardiovascular diseases, type 2 diabetes, and certain types of cancer, placing significant pressure on healthcare systems globally.[3]

Beyond its medical consequences, obesity is increasingly recognized as a complex condition influenced by behavioural, environmental, and psychosocial factors. In particular, obesogenic environments that promote excessive energy intake and sedentary lifestyles play a critical role in shaping dietary patterns and weight-related outcomes in young populations.[4,5] Therefore, understanding the interplay between lifestyle behaviours and health outcomes during early adulthood has become a major priority for public health research.

Young adulthood represents a critical life stage during which long-term lifestyle behaviours are established. University students, in particular, experience significant transitions in their daily routines, including changes in dietary habits, physical activity, sleep patterns, and psychosocial stressors. These transitions may increase the likelihood of adopting unhealthy eating behaviours and contribute to weight gain.[6,7]

Previous studies have described obesogenic eating behaviours as dietary patterns that promote excessive energy intake and weight gain.[5] However, the present study focused on selected obesity-related dietary behaviours, including dietary behaviour score, fruit and vegetable consumption, and sugar-sweetened beverage intake.

Psychological factors also play an important role in the development of obesity. Depression, which is increasingly prevalent among young adults, has been associated with unhealthy dietary behaviours, reduced physical activity, and weight gain.[8] Conversely, obesity may negatively affect psychological well-being and increase the risk of depressive symptoms, suggesting a bidirectional relationship between obesity and mental health.[9]

Previous studies have reported associations between obesity and depressive symptoms, as well as between selected obesity-related dietary behaviours and obesity, although these relationships have generally been investigated separately.[5,8,9] Diet quality has also been shown to be closely associated with mental health among university students.[10] However, studies simultaneously evaluating selected obesity-related dietary behaviours, body-mass index (BMI), and depressive symptoms within the same young adult population remain limited.

Therefore, this study aimed to examine the associations between selected obesity-related dietary behaviours, BMI, and depressive symptoms among university students aged 18-24 years.

METHODS

Ethics

This study was conducted with the approval of the Amasya University Ethics Committee for Non-interventional Clinical Researches (Date: 25.07.2022, Decision No: 74). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. Written informed consent was obtained from all individual participants prior to their inclusion in the study.

Study Design and Participants

This cross-sectional study was conducted among university students aged 18-24 years studying at Amasya University, Turkiye. According to university records, the total student population consisted of 11.437 individuals.

The minimum required sample size was calculated as 372 participants based on a population of 11.437 students, a 95% confidence level, a 5% margin of error, and an expected proportion of 50%. Considering that multivariable statistical analyses were planned, the study sample was expanded to 632 participants to increase statistical power.

Participants were recruited from different faculties of the university using a voluntary participation approach. Questionnaires were administered face-to-face, and students who agreed to participate were included in the study.

Data Collection

Data were collected using a structured questionnaire prepared by the researchers based on the relevant literature. The questionnaire consisted of sections related to:

- socio-demographic characteristics
- health status
- nutritional behaviours
- physical activity habits

Participants were asked to report their age, sex, monthly income (categorized as sufficient or insufficient to meet basic needs), presence of chronic disease, and whether they had previously received medical nutrition therapy (MNT), defined as individualized dietary counselling provided by a physician or dietitian for weight management or healthy eating.

Anthropometric Assessment

BMI was calculated using the participants' self-reported body weight and height values. BMI was calculated according to the standard formula:

$$BMI = \text{weight (kg)} / \text{height (m}^2\text{)}$$

Participants were classified according to World Health Organization (WHO) BMI classification criteria as normal weight, overweight, or obese.[11]

Assessment of Selected Obesity-related Dietary Behaviours

Dietary behaviours were assessed using a 14-item Dietary Behaviour Scale previously described by Haney and Erdogan.[12] Each item presents two illustrated food options representing a healthier and a less healthy choice, and participants were asked to indicate which food they consumed more frequently. Less healthy choices were scored as -1, whereas healthier choices were scored as +1. The total raw score ranged from -14 to +14, with higher scores indicating healthier dietary behaviours. The raw score was subsequently converted into a percentage score ranging from 0 to 100, with higher percentage scores representing healthier dietary behaviours.[12]

In addition, participants were asked about the frequency of fruit consumption, frequency of vegetable consumption, and daily caloric intake from sugar-sweetened beverages (kcal/day). These variables were analysed separately to evaluate their associations with BMI. Daily caloric intake from sugar-sweetened beverages was entered into the logistic regression model as a continuous variable.

Physical Activity Assessment

Physical activity was assessed using the short form of the International Physical Activity Questionnaire (IPAQ-SF), which evaluates vigorous-intensity activity, moderate-intensity activity, walking, and sitting time performed during the previous seven days. Participants reported the frequency (days/week) and duration (minutes/day) of each activity. Metabolic equivalent (MET) scores were calculated according to the IPAQ scoring protocol and used as a continuous measure of physical activity in the statistical analyses. Higher MET scores indicated higher levels of physical activity.[13]

Depression Assessment

Depressive symptoms were assessed using the Patient Health Questionnaire-9 (PHQ-9), a widely used screening instrument for depression. The PHQ-9 consists of nine items evaluating the frequency of depressive symptoms experienced over the previous two weeks. Each item is scored on a four-point Likert scale ranging from 0 (not at all) to 3 (nearly every day), resulting in a total score ranging from 0 to 27.

Higher PHQ-9 scores indicate greater severity of depressive symptoms.[14]

Statistical Analysis

The data were performed using IBM SPSS Statistics version 22 (IBM Corp., Armonk, NY, USA). The distribution of continuous variables was assessed using the Kolmogorov-Smirnov test. Variables showing an approximately normal distribution were summarized as mean±standard deviation, whereas categorical variables were presented as frequencies and percentages.

BMI was used as the main outcome variable in the analyses evaluating obesity-related factors. Independent variables included dietary behaviour score, daily caloric intake from sugar-sweetened beverages, fruit and vegetable consumption frequency, screen time, and physical activity level expressed as MET score.

For logistic regression analysis, BMI classification was dichotomized as normal weight versus increased BMI category, which included participants classified as overweight or obese according to the WHO criteria. Normal weight was used as the reference category.

Logistic regression analysis was performed to examine the associations between selected obesity-related dietary behaviours and BMI classification. Independent variables included dietary behaviour score, sugar-sweetened beverage consumption, fruit consumption frequency, vegetable consumption frequency, screen time, and physical activity level. Regression coefficients (B), odds ratios (ORs), Wald statistics, and p values were reported.

Linear regression analysis was used to evaluate the association between BMI and depressive symptoms assessed using PHQ-9 scores. BMI was entered as the independent variable and depression score as the dependent variable. Regression coefficients, standardized beta coefficients (β), t statistics, and p values were reported.

Statistical significance was accepted as $p<0.05$.

RESULTS

Participant Characteristics

A total of 632 university students aged 18-24 years participated in the study. Among the participants, 398 (63%) were female and 234 (37%) were male. The mean age of the participants was 20.2 years.

According to BMI classification, 435 participants (68.8%) were of normal weight, 150 (23.7%) were overweight, and 47 (7.4%) were classified as obese.

Regarding monthly income status, 144 participants (22.8%) reported that their income was insufficient to meet their basic needs, whereas 488 participants (77.2%) reported that their income was sufficient.

Most participants (n=516; 81.6%) reported that they had not previously sought MNT for weight loss or healthy eating, while 116 participants (18.4%) had received such therapy.

The majority of participants reported no diagnosed disease (n=536; 84.8%), whereas 96 participants (15.2%) reported having at least one disease.

Among participants reporting a disease, the most frequently reported conditions were anaemia (19.8%), respiratory tract diseases (13.5%), digestive system diseases (12.5%), diabetes (10.4%), and bone and joint diseases (10.4%).

Detailed socio-demographic and health characteristics of the participants are presented in **Table 1**.

Table 1. Sociodemographic characteristics of university students

	n	%
Gender		
Female	398	63
Male	234	37
Body-mass index classification		
Normal	435	68.8
Overweight	150	23.7
Obese	47	7.4
Monthly income		
Insufficient to meet my basic needs	144	22.8
Sufficient to meet my basic needs	488	77.2
Mean age (years)±SD	20.2±1.5	
Seeking medical nutrition therapy due to weight loss/healthy eating		
No	516	81.6
Yes	116	18.4
Condition of having the disease		
No	536	84.8
Yes	96	15.2
Diseases possessed by individuals (n=96)		
Cardiovascular diseases	9	9.4
Diabetes	10	10.4
Kidney diseases	5	5.2
Anaemia	19	19.8
Bone and joint diseases	10	10.4
Digestive system diseases	12	12.5
Liver and gallbladder diseases	2	2.1
Respiratory tract diseases	13	13.5
Other	16	16.7

n=632. SD: Standard deviation

Association Between Selected Obesity-related Dietary Behaviours and BMI Classification

The associations between selected obesity-related dietary behaviours and BMI classification were examined using logistic regression analysis. Dietary behaviour scores were significantly associated with BMI classification (B=-0.10, p=0.001), indicating that higher dietary behaviour scores were associated with lower odds of belonging to the increased BMI category (B=-0.10, OR=0.91, p=0.001). In contrast, higher caloric intake from sugar-sweetened beverages was associated with higher odds of increased BMI (B=0.02, OR=1.02, p=0.001).

No statistically significant association was observed between BMI classification and fruit consumption frequency, vegetable consumption frequency, or screen time ($p>0.05$). However, physical activity level (MET score) was significantly associated with BMI classification (p=0.010).

The detailed results of the logistic regression analysis are presented in **Table 2.**

Association Between BMI and Depression

The relationship between BMI and depression scores was examined using linear regression analysis.

The results showed that BMI was significantly associated with depression scores (B=1.64, β=0.15, t=2.91, p=0.004), indicating that individuals with higher BMI values tended to have higher depression scores.

The detailed results of this analysis are presented in **Table 3**.

Table 3. The relationship between depression and body-mass index among university students

	B	SE	β	t	p
Body-mass index	1.64	.56	.15	2.91	.004**

p<0.01**. SE: Standard error

DISCUSSION

This study examined the associations between selected obesity-related dietary behaviours, BMI, and depressive symptoms among university students aged 18-24 years. The findings indicate that unhealthy dietary behaviours and higher caloric intake from sugar-sweetened beverages were associated with higher BMI, while physical activity level showed a significant relationship with BMI. In addition, the results demonstrated a significant association between BMI and depressive symptoms among the participants. These findings highlight the complex interaction between behavioural, lifestyle, and psychological factors influencing obesity risk in young adults.

One of the most important findings of the present study is the association between selected obesity-related dietary behaviours and BMI. Higher dietary behaviour scores were associated with lower odds of belonging to the increased BMI category, suggesting that healthier dietary behaviours may play a protective role against obesity risk among university students. This finding is consistent with previous research suggesting that unhealthy dietary behaviours, particularly frequent consumption of energy-dense and ultra-processed foods, contribute to excessive energy intake and subsequent weight gain.[15,16]

University students may be particularly vulnerable to unhealthy dietary behaviours due to lifestyle transitions, including irregular meal patterns and increased reliance on convenience foods. Environmental factors such as easy access to fast food and limited time for meal preparation may further promote unhealthy eating behaviours.[16]

In addition, financial limitations commonly experienced by university students may increase reliance on inexpensive, energy-dense foods, which may further contribute to unhealthy dietary behaviours associated with obesity.[16]

Another key finding of the present study is the association between sugar-sweetened beverage consumption and BMI. Sugar-sweetened beverages are considered a major contributor to excess caloric intake and may promote positive energy balance due to their low satiety effect.[17] Previous epidemiological studies have consistently demonstrated that regular consumption of sugar-sweetened beverages is associated with increased risk of overweight, obesity, and weight gain among both adolescents and adults.[18,19] In addition, frequent consumption of sugary beverages has been linked to poorer overall dietary quality and increased intake of ultra-processed foods, which may further contribute to obesity risk.[17,18]

In contrast, the present study did not find a significant association between fruit and vegetable consumption frequency and BMI. Although fruit and vegetable intake is generally considered protective against obesity, previous studies have reported mixed findings in young adult populations.[16] One possible explanation is that frequency of consumption alone may not accurately reflect total intake or dietary quality. For example, individuals may consume fruits

Table 2. Association between selected obesity-related dietary behaviours and body-mass index

	B	SE	Wald χ^2	df	p-value	OR
Dietary behaviour score (%)	-.10	.01	69.65	1	0.001***	0.91
Calorie intake from daily consumption of sweetened beverages	0.02	.00	54.5	1	0.001***	1.02
Fruit consumption frequency						
Every day	1.30	0.71	3.35	1	.067	3.68
Every other day	.65	.69	.88	1	.348	1.91
Once or twice a week	.16	.65	.06	1	.810	1.17
Once every 15 days	.40	.75	.28	1	.594	1.49
Vegetable consumption frequency						
Every day	0.05	.75	0.00	1	.950	1.05
Every other day	.42	.74	.32	1	.570	1.52
Once or twice a week	.11	.72	0.02	1	.877	1.12
Once every 15 days	.30	.80	0.14	1	.710	1.35
Screen time	0.04	0.08	0.27	1	.601	1.04
Physical activity level (MET score)	-.0003	0.0001	6.56	1	0.010*	-

Reference category: Never/rarely consumption. OR was not shown for MET score because the effect size per one-unit increase was extremely small. SE: Standard error, OR: Odds ratio, MET: Metabolic equivalent of task

and vegetables occasionally while still maintaining an overall energy-dense diet.

Physical activity level was significantly associated with BMI in the present study. Although the magnitude of the association was relatively small, this finding is consistent with previous studies reporting that physically inactive university students are at greater risk of overweight and obesity than their more active peers.[20] Regular physical activity contributes to energy balance by increasing energy expenditure and may help prevent excessive weight gain. Although the observed effect sizes were modest, the association may still have important public health implications because physical activity is a modifiable behaviour. Even relatively small increases in physical activity across university populations could contribute to meaningful reductions in obesity risk and improvements in overall well-being.

Another important finding of the present study is the significant association between BMI and depressive symptoms. Participants with higher BMI values were more likely to report higher depression scores. This finding is consistent with previous research indicating a bidirectional relationship between obesity and depression.[21] Several mechanisms have been proposed to explain this relationship. For example, obesity may negatively influence self-esteem, body image, and social interactions, which may contribute to depressive symptoms.

At the same time, depression may influence eating behaviours and physical activity patterns. Individuals experiencing depressive symptoms may be more likely to engage in emotional eating, reduce their level of physical activity, and adopt unhealthy lifestyle behaviours that may contribute to weight gain.[22,23] This reciprocal relationship highlights the importance of considering both physical and mental health factors when addressing obesity among young adults.

In university populations, this relationship may be further influenced by psychosocial stressors such as academic pressure, irregular sleep patterns, social isolation, and concerns related to future career opportunities. These factors may contribute both to unhealthy lifestyle behaviours and to increased psychological distress among young adults.

Previous studies have also suggested that psychosocial stressors commonly experienced during university years may contribute to both depression and unhealthy eating behaviours.[23,24] Academic pressure, social adjustment, financial stress, and lifestyle changes may increase vulnerability to both mental health problems and unhealthy lifestyle habits among students. Therefore, addressing psychological well-being may be an important component of obesity prevention strategies in this population.[24]

The findings of the present study have important public health implications. University years represent a critical period for the establishment of long-term lifestyle behaviours. Interventions targeting university students may therefore play an important role in preventing obesity and promoting healthier lifestyles. Health promotion programs focusing on improving nutritional behaviours, reducing sugar-sweetened beverage consumption, and increasing physical activity may help reduce obesity risk among young adults. In many developing countries, including Turkiye, rapid lifestyle changes, increasing consumption of processed foods, and reduced physical activity among young adults may further increase obesity risk in university populations.

In addition, integrating mental health support into health promotion strategies may further improve the effectiveness of obesity prevention interventions. Considering the relationship between depression and BMI observed in this study, addressing mental health may be an important component of comprehensive obesity prevention programs targeting university populations.

Limitations

The present study has several limitations that should be considered. First, the cross-sectional design limits the ability to establish causal relationships between variables. Second, anthropometric measurements, dietary behaviours, physical activity, and depressive symptoms were assessed using self-reported data, which may have introduced recall and reporting bias. Finally, because the study was conducted at a single university, the findings may not be generalizable to other university populations.

CONCLUSION

The findings of this study highlight the significant role of selected obesity-related dietary behaviours and lifestyle factors in shaping BMI among university students. In particular, unhealthy dietary behaviours, sugar-sweetened beverage consumption, and low levels of physical activity were associated with higher BMI.

In addition, the observed association between BMI and depressive symptoms suggests that physical and mental health factors are closely interconnected in this population. These results support the view that obesity in young adults should be addressed within a multidimensional framework that includes both behavioural and psychological determinants.

Given that young adulthood is a critical period for the establishment of long-term health behaviours, early interventions targeting dietary habits, physical activity, and mental well-being may play an essential role in preventing obesity and its associated health consequences. Therefore, integrated and multidisciplinary strategies are needed to effectively address obesity risk among university students.

ETHICAL DECLARATIONS

Ethics Committee Approval

This study was conducted with the approval of the Amasya University Ethics Committee for Non-interventional Clinical Researches (Date: 25.07.2022, Decision No: 74).

Informed Consent

Written informed consent was obtained from all individual participants prior to their inclusion in the study. Participants were fully informed about the study's aims, procedures, potential risks and benefits, and their rights-including the right to withdraw at any time without consequence. All participants voluntarily signed a written informed consent

form.

Peer Review Process

This manuscript was subject to external peer review.

Conflict of Interest

The authors declare no conflicts of interest related to this study.

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Author Contributions

Concept: AEA, AA, ST; Design: AEA, AA, ST; Control: AA, YK, SGB, HFG, SFB; Data Collection and/or Processing: AEA; Analysis and/or Interpretation: AEA, AA, ST; Literature Review: AEA, AA; Writing the Article: AEA, AA; Critical Review: AA, ST, YK, SGB, HFG, SFB.

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Letter to the Editor

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Comments on the interpretation of the effects of dienogest therapy on CA125 and systemic inflammatory indices in endometriosis

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Dear Editor,

We read with great interest the article by Bulut Arıkan and Sağsöz[1] entitled "Impact of dienogest therapy on CA125 levels, hormonal profile, and systemic inflammatory indices in endometriosis." The authors' effort to evaluate the effects of dienogest treatment on CA125, hormonal profile, and systemic inflammatory indices in women with endometriosis represents a valuable contribution to the literature.[1,2] However, we believe that certain aspects of the study design and interpretation of the findings warrant a more cautious discussion.[1,3]

First, the study has a single-center, retrospective, uncontrolled pre-post design.[1] In such retrospective designs, the use of existing records and the absence of randomization inherently limit control over exposure and concomitant factors and may introduce selection bias and residual confounding.[3] Consequently, the post-treatment changes observed in laboratory parameters can only be attributed to dienogest with considerable caution, as time-related trends, co interventions, and unmeasured confounders cannot be excluded.[3] Although statistically significant p values are reported, the effect sizes appear generally small; for instance, the authors describe approximately a 15.1% reduction in CA125 and a 7.5% reduction in PLR, with modest increases in hemoglobin and hematocrit.[1] These findings support favorable biological trends but do not necessarily imply robust clinical impact, which should be explicitly discussed.[3]

Second, the authors conclude that dienogest modulates systemic inflammatory burden and exerts an anti inflammatory effect.[1] However, in the presented results, statistically significant improvement in inflammatory indices is essentially limited to PLR, whereas no significant differences are observed in NLR, SII, SIRI, or PIV.[1] Considering that systemic inflammation is usually inferred from consistent changes across multiple markers,[4] this pattern suggests that the anti inflammatory effect on systemic inflammation may be selective or limited rather than global. Thus, statements implying a marked reduction in systemic inflammatory load may be stronger than what the data support, and a more conservative wording, such as "improvement in selected hematological and inflammatory markers," could be more appropriate.[1,4]

Third, the increase in hemoglobin and hematocrit is plausibly attributed by the authors to reduced menstrual blood loss and mitigation of chronic inflammation.[1] This hypothesis is biologically reasonable, particularly in light of data showing an increased risk of iron deficiency in women with endometriosis.[5] Nevertheless, the study does not provide clinical outcomes such as bleeding pattern, pain scores, quality of life, or lesion size.[1] Without these measures, linking hematological improvement directly to amenorrhea or reduction in heavy menstrual bleeding remains speculative, and the clinical significance of these changes cannot be fully established.[3-5] Similarly, the observed increase in FSH is interpreted as preservation of endocrine homeostasis and incomplete suppression of the hypothalamic-pituitary-gonadal axis; yet no clinical safety parameters (e.g., menopausal symptoms, bone mineral density, long term adverse events) are presented to substantiate this interpretation.[1]

In summary, this study offers useful preliminary data on the potential effects of dienogest on laboratory markers in patients with endometriosis.[1] However, the retrospective, uncontrolled design, small effect sizes, and absence of detailed clinical endpoints indicate that the reported anti inflammatory activity and hematological improvement should be interpreted with caution.[2-5] Prospective, controlled studies incorporating robust clinical outcomes are needed to better define the true clinical impact of dienogest on systemic inflammation and overall health status in this patient population.[3-5] We appreciate the authors' contribution to this important field and look forward to future research that will further clarify these issues.[1]

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Letter to the Editor

Author reply " Comments on the interpretation of the effects of dienogest therapy on CA125 and systemic inflammatory indices in endometriosis"

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Dear Editor,

We would like to express our sincere appreciation for the insightful comments and constructive critiques provided by the authors regarding our article entitled "Impact of dienogest therapy on CA125 levels, hormonal profile, and systemic inflammatory indices in endometriosis" (J Controv Obstetr Gynecol Ped. 2026;4(2):25-30), published in a recent issue of your journal. This scholarly exchange is highly valuable, as it offers an opportunity to further clarify and contextualize the contribution of our work within the existing literature. Our responses to the raised points are presented below in a structured manner:

- **Regarding study design, causal inference, and scientific language:** The authors correctly emphasize that the retrospective, single-center, and uncontrolled pre-post design of our study inherently limits causal inference and external validity. We fully agree with this methodological reality. Indeed, in the Limitations section of our published manuscript, we proactively addressed this issue and explicitly stated the following: "The primary limitation of this study is its retrospective nature, which prevents the establishment of a direct causal relationship. Furthermore, while the current sample size provides significant data, further large-scale, multicenter studies are warranted to enhance the generalizability of the findings."

In addition, we concur with the authors' interpretation regarding the inferential limitations associated with causal attribution and clinical generalizability. Accordingly, a careful review of the abstract and discussion sections demonstrates that all interpretations were deliberately framed within a cautious scientific paradigm. Assertions of causality or overgeneralization were systematically avoided, and instead, standard academic hedging terminology-such as "associated with," "may exert," "suggest a potential benefit," and "may be involved"-was consistently employed in accordance with established scientific writing conventions. The study is based on a relatively robust cohort of 150 patients reflecting real-world clinical data; however, the findings were not presented as definitive or transformative evidence, and the necessity for prospective, multicenter validation studies was explicitly emphasized.

- **Regarding differential changes in systemic inflammatory indices:** The authors highlight that, despite a statistically significant reduction in platelet/lymphocyte ratio (PLR) (p=0.028), no significant changes were observed in neutrophil/lymphocyte ratio (NLR), Systemic Immune-inflammation Index (SII), or Systemic Inflammation Response Index (SIRI), and suggest that this finding may be inconsistent with the hypothesis of a broad systemic anti-inflammatory effect. As explicitly stated in the abstract, "Dienogest therapy was associated with a reduction in CA125 levels and specific inflammatory markers, alongside improvements in certain hematological parameters in patients with endometriosis," where the deliberate use of the qualifiers "specific" and "certain" precludes any claim of generalized systemic anti-inflammatory effects.

Endometriosis is a complex and highly heterogeneous inflammatory disorder, characterized by differential activation of immunological and hematological pathways. Consequently, inflammatory modulation does not necessarily manifest uniformly across all systemic biomarkers. As elaborated in the discussion section, platelets play a central and mechanistically specific role in endometriotic lesion progression, including angiogenesis, stromal proliferation, and tissue remodeling. In this context, the observed statistically significant reductions in leukocyte count (p=0.031), PLR (p=0.028), and plateletcrit (PCT) (p=0.009) are indicative of targeted attenuation of discrete subclinical inflammatory pathways.

Consistent with this interpretation, emerging evidence in the literature suggests that dienogest may exert selective immunomodulatory effects, particularly on platelet and leukocyte homeostasis, rather than inducing broad alterations in neutrophil-lymphocyte dynamics. Notably, recent studies by Kurt et al.[11] and Chung et al.[14] have demonstrated gene-level and cellular regulatory effects of dienogest on hematological homeostasis. Accordingly, the absence of significant changes in NLR or SII does not diminish the relevance of the observed reductions in PLR and PCT; rather, it underscores the pathway-specific nature of immune modulation under progestin therapy. Furthermore, a statistically significant positive correlation between CA125 and PLR was identified, suggesting that CA125 levels in endometriosis may reflect systemic inflammatory burden, in accordance with previous literature.

- **Regarding hematological outcomes, endocrine stability, and clinical interpretation:** The authors propose that, in the absence of detailed clinical outcome measures, the proposed mechanisms underlying hematological improvement and endocrine stability remain speculative. We respectfully disagree with this interpretation. In contemporary clinical physiology and reproductive medicine, validated biochemical and hematological indices are widely accepted as objective and clinically meaningful endpoints, particularly in mechanistic and translational research contexts.

In this study, the effects of dienogest therapy were evaluated using a comprehensive panel of objectively measurable clinical parameters, including CA125 levels, hormonal profile, thyroid function tests, hematological indices, and systemic inflammatory markers, thereby providing a multidimensional and integrated assessment of treatment-related physiological effects.

- **Endocrine stability:** The concept of "endocrine stability" as used in this study is not speculative, but rather directly derived from the empirical findings presented in **Table 1**. Although the retrospective design limited access to certain standardized post-treatment imaging datasets, the endocrine profile demonstrated consistent homeostatic preservation. Specifically, serum concentrations of LH, estradiol, prolactin, progesterone, TSH, FT3, and FT4 remained statistically unchanged following treatment (all $p>0.05$). While a statistically significant variation in FSH levels was observed, this change remained entirely within established physiological reference ranges. Preservation of hypothalamic-pituitary-thyroid and hypothalamic-pituitary-gonadal axis integrity within normative limits is widely recognized in the literature as a key indicator of endocrine stability.

- **Hematological outcomes:** The statistically significant increases in hemoglobin ($p=0.029$), hematocrit ($p=0.002$), mean corpuscular volume (MCV) ($p=0.012$), and mean corpuscular hemoglobin (MCH) ($p=0.015$) represent robust and clinically meaningful hematological improvements. In the context of endometriosis, a chronic condition frequently associated with dysmenorrhea and heavy menstrual bleeding, the observed hematological improvements are physiologically consistent with reduced menstrual blood loss secondary to dienogest-induced ovulatory suppression and amenorrhea. This represents a well-established pathophysiological mechanism rather than a speculative inference.

In conclusion, we sincerely thank the authors for their careful and critical appraisal of our work. Their comments have contributed to a more nuanced interpretation of our findings. We maintain that our study provides objective and clinically relevant evidence regarding the hematological and inflammatory effects of dienogest and constitutes a meaningful contribution to the literature, while also underscoring the need for future prospective, multicenter investigations.

Respectfully,