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Original Article

Factors Associated with Awareness of Microbiota among Turkish Pregnant Women: A Descriptive Study

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What is already known on this topic?

- *The microbiota found in parts of the mother's body, such as the intestines, skin, breast milk, and vagina can pass vertically to the baby.*
- *These vertical passes allow the baby to "recognize" the microbiota and program the immune system correctly.*
- *The microbiota, the foundations of which are laid in the early period, have been found to be associated with the metabolic and even neurological development of the baby in later periods.*

What this study adds on this topic?

- *While the literature generally focuses on the medical outcomes of microbiota (pregnancy outcomes, relationship with diseases, etc.), this study fills an important gap by focusing on measuring the level of "awareness" of microbiota in pregnant women.*
- *The study revealed that factors such as the level of education, employment status, social security, participation in prenatal education, and attention to food selection significantly affect microbiota awareness in pregnant women.*
- *It emphasized that nurses and midwives should allocate a special place to the subject of microbiota in prenatal education.*

ABSTRACT

Objective: This study aimed to determine factors associated with awareness of microbiota among Turkish pregnant women.

Methods: This descriptive study was conducted with 216 pregnant women who visited the obstetrics and gynecology outpatient clinic of a state hospital between October 2 and November 3, 2023. Data were collected through face-to-face interviews using the Descriptive Characteristics Information Form and the Microbiota Awareness Scale (MAS) developed by the researchers.

Results: The mean age of the pregnant women in the study was 26.99 ± 5.78. The total score on the MAS was 63.62 ± 7.88, with sub-dimensions including General Knowledge 22.74 ± 3.01, Product Knowledge 8.15 ± 2.22; Chronic Disease 15.84 ± 2.58, and Probiotic and Prebiotic Knowledge 16.87 ± 3.20. A statistically significant difference was found between microbiota awareness levels and education level, employment status, social security, attendance at prenatal education classes, attention to food intake, and food planning ($P < .05$).

Conclusion: The study found that pregnant women have a moderate level of microbiota awareness, influenced by socio-demographic factors such as education, employment, and social security. Integrating microbiota education into prenatal care by nurses and midwives in obstetrics and gynecology clinics can significantly improve pregnant women's knowledge and awareness of microbiota.

Keywords: Microbiota, nursing, prebiotics, pregnancy, probiotics

Introduction

The human body is an ecosystem that hosts trillions of microorganisms, including viruses, bacteria, fungi, and other eukaryotes, collectively known as the "microbiota".[1-3] The microbiota is primarily found in the gastrointestinal, genitourinary, and skin regions. It performs vital metabolic functions that are essential for maintaining health, such as enhancing the resistance of the mucosal barrier, ensuring tissue integrity, protecting against pathogens, and activating the immune system, making it indispensable for health maintenance.[4-6] The microbiota, an indispensable part of a healthy life, is transferred from the mother to the fetus/baby at the very beginning of life.[1,3,5,7] The development of the baby's microbiota is influenced by the microbiomes in many parts of the mother's body, such as the mouth, gut, skin, breast milk, and vagina.[8,9] Therefore, the perinatal period, when babies have the most interaction with the mother's skin,

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vagina, and feces, is the most critical period for microbiota transfer. Thus, the first microbial exposure from mother to fetus or baby occurs in the earliest stages of life. Pregnancy, childbirth, and the postnatal period are therefore the most important times for establishing a healthy microbiota.[1,3,7,10] Pregnancy is associated with significant physiological changes that can affect the maternal microbiota and, consequently, pregnancy and fetal development.[1,2,10,11] Perturbations in the microbiota before or during pregnancy increase the risk of complications such as gestational diabetes, pre-eclampsia, infections, recurrent miscarriage, and preterm birth.[1,2,11] For example, higher levels of pathogenic bacteria such as *Bulleidia* and *Clostridium perfringens* and lower levels of the probiotic *Coprococcus catus* have been observed in pregnant women diagnosed with pre-eclampsia.[2,11-13] The maternal microbiota also plays a critical role in fetal immunity and development.[2,10,11] The mother's diet, antibiotic use, and healthy lifestyle have a direct impact on the baby's microbiota. In this context, increasing awareness of the microbiota in pregnant women can help maintain and improve both maternal and infant health.[1,3,5,6]

Despite the growing interest in microbiota awareness during pregnancy in recent years, many pregnant women do not fully understand the complex relationships between microbiota and health. Several factors, such as education, socioeconomic and cultural factors, access to healthcare, antenatal care attendance, antenatal classes, and media exposure, may influence pregnant women's awareness of microbiota.[6,14,15] In addition, women with high-risk pregnancies tend to have lower levels of awareness.[6] To increase microbiota awareness, it is important to remove barriers to understanding and promote microbiota-friendly lifestyles. This approach can help regulate the composition of the microbiota, shape the microbiota in the gut and other regions of the body, and prevent metabolic disorders during pregnancy.[1,2,6,9,10]

The adaptation of maternal microbiota to pregnancy is of crucial significance for the prenatal development and postnatal maturation of the microbiota. Given that the regulation of the gut microbiota requires a minimum of 1 year, there is evidence that initiating microbiota management in the pre-pregnancy period would be beneficial. Therefore, planning pregnancy offers the opportunity to adopt nutritional practices that regulate the microbiota.[16,17] For instance, the incorporation of probiotics and prebiotics into the diet has been shown to exert a favorable influence on the composition of the gut microbiota, a factor that is of paramount importance for both maternal and fetal health.[18,19] However, it is emphasized that increasing probiotic consumption during pregnancy, incorporating high-fiber foods into the diet, engaging in regular exercise, utilizing antibiotics judiciously, and promoting vaginal birth and breastfeeding are all microbiota-friendly lifestyles.[5-7] A healthy maternal diet and lifestyle have been shown to positively influence the microbiota transferred to the newborn. The maternal microbiota, encompassing the gut, vagina, and breast milk, along with these practices that persist throughout pregnancy, exerts a substantial influence on the baby's microbiota and immune development.[6,7,20] In this direction, increasing the awareness of pregnant women about microbiota is an important factor in the desire of the pregnant woman to have a vaginal birth, to continue breastfeeding, and to shape healthy life behaviors. Determining the microbiota awareness of pregnant women may guide the planning of initiatives to raise awareness among pregnant women.[6,21]

Purpose of Study

This study aimed to determine factors associated with awareness of microbiota among Turkish pregnant women.

Research Questions

1. What are the awareness levels of pregnant women about microbiota?
2. What are the factors associated with microbiota awareness of pregnant women?

Material and Method

Study Design

This cross-sectional study was conducted with 216 pregnant women in a state hospital in the central Anatolian region of Türkiye. The data for this research were collected through face-to-face interviews with pregnant women who visited the obstetrics and gynecology outpatient clinics between October 2 and November 3, 2023.

Sample of the Study

The universe of the study included pregnant women who visited the obstetrics and gynecology clinics of the specified hospital during the study period. The sample consisted of pregnant women who met the inclusion criteria and agreed to participate in the study. A total of 216 pregnant women participated in the study with no specific sample selection process. Power analysis conducted after the study (G-Power 3.1.9.7) determined that the sample had 99% power with a 0.85 effect size and a 95% CI.

The inclusion criteria for the study were: i- willingness to participate, ii- no communication problems, iii- being 18 years of age or older, iv- Turkish pregnant women. The exclusion criteria were: i- being a healthcare professional, ii- incomplete data collection forms, iii- pregnant women of different nationalities (Syrian, Afghan).

Data Collection Tools

Data were collected using the Descriptive Characteristics Information Form and the Microbiota Awareness Scale (MAS).

Descriptive Characteristics Information Form: This form was prepared by the researchers in line with the literature.[2,5,10,20] The survey form consists of a total of 16 questions examining the sociodemographic (age, family type, education level, occupation, income status, etc.) and obstetric characteristics (number of pregnancies, participation in prenatal education classes, etc.) of women.

Microbiota Awareness Scale: The scale was developed by Külcü and Önal[22] to determine the microbiota awareness levels of individuals. It is a 5-point Likert-type, 20-item scale consisting of 4 sub-dimensions: "General Information" (questions 1, 2, 4, 5, 6, 13), "Probiotic and Prebiotic Knowledge" (questions 3, 7, 9, 11, 15), "Chronic Disease" (questions 8, 10, 12, 14, 16), and "Product Knowledge" (questions 17, 18, 19, 20). The lowest score that can be obtained from the scale is 18, and the highest score is 100. A high score obtained from the scale, which does not have any cut-off point, is interpreted as a high level of microbiota awareness.[22] While the Cronbach α coefficient was found to be 0.85 in the validity and reliability study of the scale,[22] the Cronbach α coefficient was calculated as 0.79 in the study.

Data Collection

The data for the study were collected through face-to-face interviews with pregnant women who applied to the hospital's obstetrics and gynecology clinic for pregnancy follow-up and met the inclusion criteria. The data were collected within an average of 10-15 minutes after the pregnant women were verbally informed about the study and their consent was obtained.

Ethics of the Study

Before starting the research, written approval (Number: 16.06.2023; Approval nor: 2023.06.16) was obtained from the Ethics Committee of the the Human Research Ethics Committee of Nevşehir Hacı Bektaş Veli University. Written permission (Date: 19.04.2024; Approval no:

E-26171210-929-225506878) was obtained from the relevant hospital management to conduct the research. In addition, information was provided to the pregnant women participating in the research about the purpose of the research, the benefits to be obtained from the research, and the time they would spend for the interview, and their consent was obtained.

Statistical Analysis

Statistical Package for the Social Sciences (SPSS) version 25.0 (IBM Corp., Armonk, NY, USA) was used to evaluate the data obtained from the study. Mean and standard deviation were used for numerical measurements, and number and percentage were used for categorical measurements. The suitability of the variables for normal distribution was determined by the "Kolmogorov–Smirnov" test according to the number of samples. In this direction, the "Kruskal–Wallis test" was used for multiple group comparisons that did not show normal distribution, the "Independent sample test" was used for 2 independent group comparisons that showed normal distribution, and the "ANOVA test" was used if the number of groups was more than two. As a result of the analysis, Levene's test was first used for homogeneity of variance, and then the group or groups from which the difference originated were checked by the "Bonferroni–multiple comparison test". Multiple Linear Regression Analysis was used to examine the variables predicting the microbiota awareness level of pregnant women. The statistical significance level was accepted as $P < .05$.

Results

A comparison of some characteristics of pregnant women participating in the study and the mean score of the MAS is presented in Table 1. About 79.2% of the pregnant women were aged 20-34, with a mean age of 26.99 ± 5.78. It was found that 32.9% of the pregnant women were secondary school graduates, 85.6% were housewives, 78.7% had a nuclear family, and 84.7% had income equal to expenses. Additionally, 64.8% were multiparous, and 76.4% were in their 28-40th weeks of pregnancy. Furthermore, 79.2% stated their pregnancy was planned, and 25% attended prenatal education classes.

The total score of the MAS scale was 63.62 ± 7.88 (18.00-100.0) with sub-dimensions as follows: General Knowledge 22.74 ± 3.01 (6.00-30.00); Product Knowledge 8.15 ± 2.22 (2.00-20.00); Chronic Disease 15.84 ± 2.58 (5.00-25.00); Probiotic and Prebiotic Knowledge 16.87 ± 3.20 (5.00-25.00) (Table 2). The distribution of pregnant women according to their responses to the sub-dimensions of the MAS is given in Figure 1. Pregnant women were not sure about the majority of their answers to the questions. It is seen that women's awareness is low, especially in the Product knowledge sub-dimension.

In the study, a statistically significant difference was found between the educational levels of pregnant women and microbiota awareness, general information, product knowledge and probiotic and prebiotic knowledge sub-dimension scores ($P < .05$). According to the statistical analysis performed to determine from which groups the difference originated, it was determined that the levels of microbiota awareness, general information, product knowledge, and probiotic and prebiotic knowledge were lower in pregnant women who graduated from primary school compared to pregnant women who graduated from high school, and in pregnant women who graduated from primary school compared to pregnant women who graduated from university or above ($P < .05$). In the study, a statistically significant difference was found between the working status of pregnant women and microbiota awareness, general information, product knowledge, chronic disease and probiotic and prebiotic knowledge sub-dimension scores ($P < .05$). It was found that the microbiota awareness level, general information, product knowledge, chronic disease and probiotic and prebiotic knowledge of working women were higher than non-working (housewife) women (Table 1).

A statistically significant difference was found between having health insurance and microbiota awareness levels and product knowledge ($P < .05$). A statistically significant difference was found between attending prenatal education classes, paying attention to food intake, and planning their food, and microbiota awareness levels of pregnant women ($P < .05$). Otherwise, no statistically significant difference was found between the microbiota awareness levels of pregnant women and age, family type, economic status, parity, gestational week, and planned pregnancy ($P > .05$) (Table 1).

The variables (educational status, working status, health insurance, attending prenatal education classes, paying attention to food intake, planning their food) that showed significance ($P < .05$) as a result of the statistical analysis were included in the multiple linear regression analysis. As a result of multiple linear regression analysis, the level of microbiota awareness of pregnant women is affected by educational status, working status, and food planning status and explains 20% of the variance (R^2 adjusted = 0.202, F = 8.789, $P < .001$). According to the model, it was determined that pregnant women with high school graduation had higher microbiota awareness levels than pregnant women with primary school graduation, working pregnant women had higher microbiota awareness levels than non-working pregnant women, and those who did not plan their meals had lower microbiota awareness levels than those who planned their meals (Table 3).

Discussion

Considering the studies emphasizing the important effects of microbiota on maternal and fetal health during pregnancy, determining the microbiota awareness of pregnant women becomes crucial.[6,10,21] There are limited studies in the literature evaluating microbiota awareness during pregnancy.[6,21] This study aimed to determine factors associated with awareness of microbiota among Turkish pregnant women.

In this study, it was found that pregnant women had a moderate level of microbiota awareness (63.62 ± 7.88). Cömert et al[6] reported that pregnant women in the first trimester had a moderate level of microbiota awareness (61.38 ± 11.00). Consales et al[20] reported that Italian mothers had a moderate level of knowledge about infant gut microbiota, and Cevik Guner and Kissal[15] reported that 20.2% of mothers knew what probiotics were, 33.1% had knowledge about specific probiotic products, and 49.7% knew that breast milk contained probiotics. A study found that only 36.4% of pregnant women understood that the intrauterine period affects gastrointestinal microbiota composition.[23] Another study also shows that many women planning pregnancy possess only partial knowledge about microbiota, probiotics, and their health impacts, which can influence pregnancy outcomes.[18] Overall, there is a lack of knowledge about the microbiota among pregnant women, many studies have shown.

In this study, it was found that as the level of education of pregnant women increased, microbiota awareness also increased. Supporting the findings, Cömert et al[6] reported that the level of education positively contributed to the increase in microbiota awareness in pregnant women. Similarly, a study on maternal characteristics and microbial diversity indicated that maternal education was associated with differences in gut microbiota diversity during pregnancy.[24] Other studies have also suggested that as the level of education of pregnant women increases, so does their awareness and understanding of microbiota. This is evidenced by higher knowledge scores among women with higher education levels and the positive

Table 1. Comparison of Some Characteristics of the Pregnant Women and the Mean Score of the Microbiota Awareness Scale (n = 216)

Characteristics	n	%	MAS Total Score Mean ± SD	General Information Mean ± SD	Product Knowledge Mean ± SD	Chronic Disease Mean ± SD	Probiotic and Prebiotic Knowledge Mean ± SD
Age							
≤19	13	6.0	61.07 ± 6.33	21.76 ± 2.45	7.76 ± 1.92	15.07 ± 2.01	16.46 ± 3.35
20-34	171	79.2	63.62 ± 7.97	22.67 ± 3.05	8.19 ± 2.20	15.81 ± 2.61	16.94 ± 3.15
≥35	32	14.8	64.62 ± 7.90	23.50 ± 2.92	8.09 ± 2.48	16.31 ± 2.60	16.71 ± 3.48
KW			2.242	1.743	0.239	1.110	0.181
P			.326	.178	.788	.331	.834
Education status							
Primary	100	46.3	60.77 ± 7.73	22.00 ± 3.33	7.41 ± 2.16	15.44 ± 2.54	15.92 ± 3.16
High	66	30.6	65.34 ± 7.24	23.22 ± 2.75	8.33 ± 2.06	16.24 ± 2.44	17.54 ± 3.18
University and above	50	23.1	67.04 ± 7.05	23.58 ± 2.30	9.42 ± 1.94	16.12 ± 2.77	17.92 ± 2.80
F			14.432	6.080	15.809	2.315	9.190
P			**<.001**[a,b]	**.003**[a,b]	**<.001**[a,b,c]	.101	**<.001**[a,b]
Working status							
Employement	31	14.4	70.35 ± 7.84	24.41 ± 2.48	9.67 ± 2.11	17.03 ± 03	19.22 ± 2.82
Nonemployement (Housewife)	185	85.6	62.49 ± 7.32	22.45 ± 3.01	7.90 ± 2.14	15.64 ± 2.44	16.48 ± 3.10
t			−5.212	−3.430	−4.271	−2.811	−4.606
P			**<.001**	**.001**	**<.001**	**.005**	**<.001**
The type of family							
Nuclear	170	78.7	63.63 ± 7.55	22.59 ± 2.97	8.26 ± 2.24	15.82 ± 2.60	16.93 ± 3.22
Extended	46	21.3	63.61 ± 7.98	23.28 ± 3.15	7.76 ± 2.13	15.91 ± 2.54	16.67 ± 3.16
t			0.010	1.376	−1.365	0.208	−0.490
P			.992	.170	.174	.836	.625
Health insurance							
Yes	169	78.2	64.37 ± 8.03	22.87 ± 3.09	8.45 ± 2.19	15.99 ± 2.59	17.04 ± 3.16
No	47	21.8	60.91 ± 6.71	22.25 ± 2.68	7.08 ± 2.00	15.29 ± 2.49	16.27 ± 3.30
t			2.699	1.248	3.853	1.638	1.462
P			**.008**	.213	**<.001**	.103	.145
Perceived income status							
Income is lower than outgoings	20	9.3	63.05 ± 6.99	22.55 ± 3.37	7.30 ± 2.47	16.00 ± 2.12	17.20 ± 3.56
Income is equal to outgoings	183	84.7	63.49 ± 7.96	22.67 ± 2.99	8.24 ± 2.18	15.72 ± 2.58	16.85 ± 3.166
Income is higher than outgoings	13	6.0	66.23 ± 8.03	23.92 ± 2.69	8.30 ± 2.32	17.30 ± 2.95	16.69 ± 3.42
KW			2.062	2.218	3.323	3.734	0.378
P			.357	.330	.190	.155	.828
Parity							
Primipar	76	35.2	63.80 ± 7.28	23.19 ± 2.63	8.27 ± 1.97	15.56 ± 2.72	16.76 ± 3.22
Multipar	140	64.8	63.52 ± 8.21	22.49 ± 3.18	8.09 ± 2.35	15.99 ± 2.50	16.94 ± 3.20
t			0.250	1.739	0.579	−1.160	−0.393
P			.803	.084	.564	.247	.695
Pregnancy status							
Planned	171	79.2	63.36 ± 7.51	22.85 ± 2.92	8.01 ± 2.10	15.67 ± 2.55	16.81 ± 3.13
Unplanned	45	20.8	64.60 ± 9.17	22.31 ± 3.32	8.68 ± 2.60	16.48 ± 2.65	17.11 ± 3.47
t			−0.937	1.074	−1.810	−1.895	−0.544
P			.350	.284	.072	.059	.587
Gestational week							
FirstTrimester (6-12 w)	10	4.6	63.00 ± 5.33	21.60 ± 2.01	9.10 ± 1.85	15.40 ± 2.50	16.90 ± 2.18
Second Trimester (13-27 w)	40	18.5	64.20 ± 6.84	22.37 ± 3.00	8.67 ± 2.21	16.15 ± 2.37	17.00 ± 2.81
Third Trimester (28-40 w)	166	76.9	63.51 ± 8.25	22.89 ± 3.06	7.97 ± 2.22	15.79 ± 2.64	16.84 ± 3.35
KW			0.343	3.025	5.875	0.459	0.215
P			.842	.220	.053	.795	.898
Attending prenatal education classes							
Yes	54	25.0	65.59 ± 8.22	23.18 ± 3.23	8.62 ± 2.10	16.29 ± 2.77	17.48 ± 3.24
No	162	75.0	62.96 ± 7.67	22.59 ± 2.93	8.00 ± 2.24	15.69 ± 2.51	16.67 ± 3.17
t			2.141	1.251	1.810	1.493	1.599
P			**.033**	.212	.072	.137	.111

(*Continued*)

Table 1. Comparison of Some Characteristics of the Pregnant Women and the Mean Score of the Microbiota Awareness Scale (n = 216) (*Continued*)

Characteristics	n	%	MAS Total Score Mean ± SD	General Information Mean ± SD	Product Knowledge Mean ± SD	Chronic Disease Mean ± SD	Probiotic and Prebiotic Knowledge Mean ± SD
Paying attention to food intake							
Yes	178	82.4	64.26 ± 7.91	22.92 ± 2.98	8.34 ± 2.23	15.92 ± 2.63	17.07 ± 3.26
No	38	17.6	60.60 ± 7.08	21.89 ± 3.06	7.26 ± 1.98	15.47 ± 2.36	15.97 ± 2.78
t			2.633	1.916	2.771	0.968	2.140
P			**.009**	.057	**.006**	.334	**.036**
Planning their food							
Yes	93	43.1	65.76 ± 8.54	23.44 ± 3.11	8.54 ± 2.36	16.04 ± 2.82	17.73 ± 3.42
No	123	56.9	62.00 ± 6.95	22.21 ± 2.84	7.86 ± 2.07	15.69 ± 2.38	16.23 ± 2.88
t			3.568	3.021	2.267	0.990	3.400
P			**<.001**	**.003**	**.024**	.323	**.001**

MAS, microbiota awareness scale; SD, standard deviation.
[a]Primary school vs High school.
[b]Primary school vs University and above.
[c]Middle school vs High school.
[d]Middle school vs University and above.

Table 2. Distribution of Total and Subdimensions Score Means of the Microbiota Awareness Scale of Pregnant Women (n = 216)

MAS and Subdimentions	Mean ± SD	Min	Max
General information	22.74 ± 3.01	6	30
Product knowledge	8.15 ± 2.22	2	20
Chronic disease	15.84 ±2.58	5	25
Probiotic and prebiotic knowledge	16.87 ± 3.20	5	25
MAS total score	63.62 ± 7.88	18	100

MAS, Microbiota Awareness Scale; Max, maximum; Min, minimum; SD, standard deviation.

impact of targeted educational interventions on microbiota awareness.[18,20,23,25] In the study by Cevik Guner and Kissal[15] evaluating probiotics use by women during pregnancy and for their babies, a positive relationship between education level and probiotics use was reported. Therefore, it can be concluded that education level affects microbiota awareness. In this study, it was determined that pregnant women who attended prenatal education classes had higher microbiota awareness levels. A study used an interactive educational game to enhance understanding of the importance of diet and lifestyle on gut microbiota during pregnancy, showing improved knowledge post-intervention.[25] Consequently, it can be inferred that education during pregnancy can be beneficial in increasing microbiota awareness.

The literature emphasizes that socio-economic characteristics of pregnant women, such as education level and employment status, can positively influence their microbiota awareness.[6,14] In the study, it was concluded that employed pregnant women with social security had higher microbiota awareness levels. Similar to the results, other studies have reported that employed pregnant women had higher microbiota awareness and probiotic use.[6,15] Cevik Guner and Kissal[15] demonstrated a positive relationship between employment status, income level, and microbiota awareness of mothers and expectant mothers. Therefore, the economic differences among employed women with social security

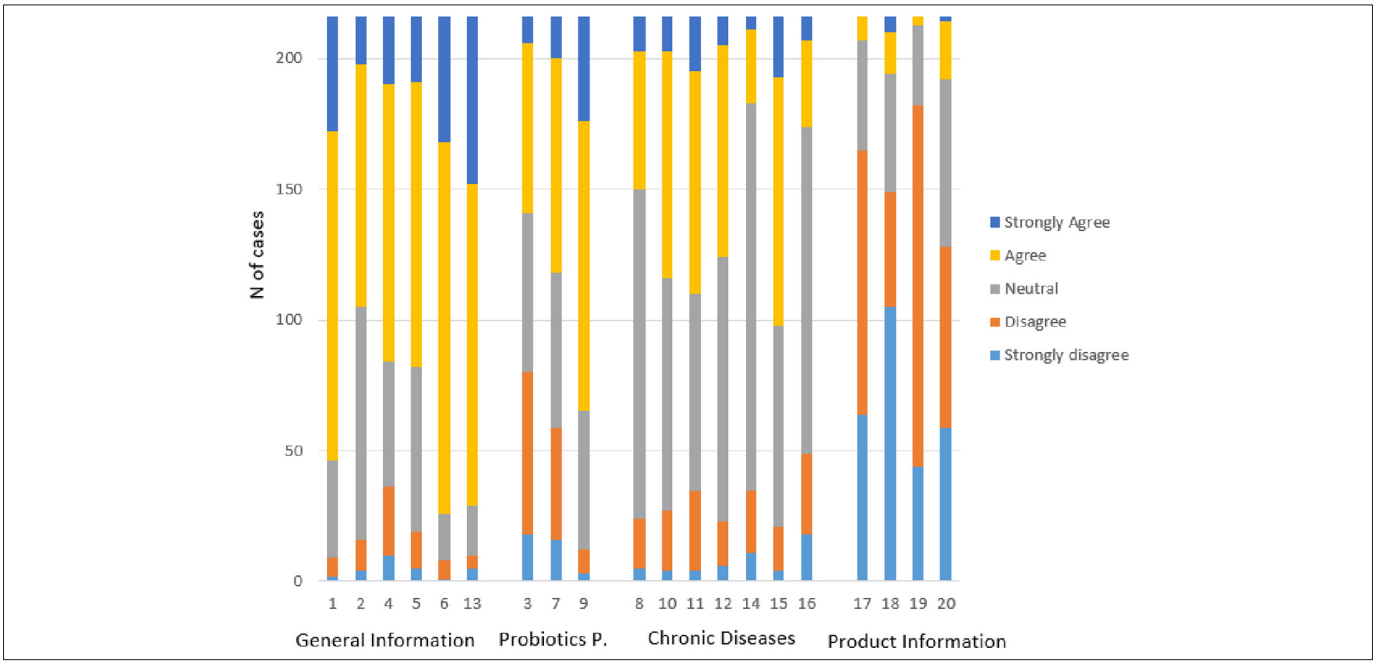

Figure 1. Distribution of pregnancy women by their responses to the microbiota awareness scale (attached file).

Table 3. Factors Predicting the Level of Microbiota Awareness in Pregnant Women

Variables	β	SE	*t*	*P*	% 95 CI Lower	Upper
Constant	64.054	1.286	49.804	**<.001****	61.518	66.589
Educational Status						
Elementary	Ref					
High school	3.285	1.151	2.855	**.005***	1.016	5.553
University and higher	2.462	1.458	1.688	.093	−0.413	5.336
Working Status						
Not employed (Housewife)	Ref					
Employed	6.099	1.593	3.829	**<.001****	2.959	9.239
Health insurance						
Yes	Ref					
No	−1.140	1.220	−0.935	.351	−3.545	1.264
Attending Prenatal Education Classes						
Yes	Ref					
No	−1.165	1.226	−1.034	.302	−3.385	1.056
Paying Attention to Food Intake						
Yes	Ref					
No	−1.794	1.321	−1.359	.176	−4.398	0.809
Planning their food						
Yes	Ref					
No	−2.538	1.026	−2.473	**.014***	−4.561	−0.515

SE, standard error. Model: R^2 adjusted = 0.202, F = 8.789, $P < .001$.
*$P < .05$.
**$P < .001$.

might have caused the results obtained in the study. Studies have indicated that the high costs of probiotics are a barrier to their use.[26,27] Hence, working women, being more advantaged socioeconomically, may have better access to probiotic products, which can positively affect their awareness.

During pregnancy, adequate and balanced nutrition is crucial in determining the microbial diversity and colonization of pregnant women.[5,21,28] The literature suggests that pregnant women who are conscientious about their diet are likely to positively influence their gut microbiota, which may lead to greater interest and awareness of microbiota-related health benefits.[29-32] In the study, it was found that pregnant women who pay attention to their food choices and meal planning have higher microbiota awareness. While the studies do not directly link attention to food choices and meal planning with higher microbiota awareness, they emphasize that women who are more conscious about their diet may better understand the microbiota's importance. According to these studies, dietary choices are known to impact gut microbiota, and awareness of this relationship could drive more informed food choices.[1,17,23,30] Chung et al[33] suggested that the level of knowledge about the health effects of microbiota in pregnant individuals may also influence their lifestyle choices. Other studies have also reported a positive relationship between women's awareness of the concepts of probiotics and prebiotics and their consumption of probiotic and prebiotic foods.[18,26,31,32] In this regard, the results from this study suggest that pregnant women are aware of the positive link between nutrition and microbiota. High microbiota awareness can lead pregnant women to adopt microbiota-friendly nutritional behaviors.[29,30,34]

Strengths and Limitations of the Study

This study has some limitations. The findings can only be generalized for the region where the study was conducted. The study is limited to data obtained from pregnant women who agreed to participate in the study on the days when the data collection tools were used. The data are based on the statements of the participants and are not clinically validated. Since there are few studies on microbiota awareness in pregnancy, comprehensive studies on this subject should be planned and conducted. Since the sample size in this study was limited, more comprehensive studies should be conducted with a larger sample group. Collecting the data through face-to-face interviews may have affected the objectivity of the participants' responses.

Conclusion

Pregnant women have a moderate level of microbiota awareness. Increases in pregnant women's level of education, employment status, health insurance, antenatal classes, and dietary planning are associated with increases in microbiota awareness. Providing information and raising awareness among pregnant women is an important step, as the microbiota is becoming more and more important and its benefits are being better understood day by day. Nurses, as key professionals in improving maternal and infant health, play a crucial role in increasing awareness among pregnant women about the impacts of microbiota on health, starting from the intrauterine period. By leveraging their clinical expertise and communication skills, nurses can educate expectant mothers about the microbiome's impact on maternal and neonatal health, thereby promoting better health outcomes. Integrating microbiota information into prenatal education topics can significantly contribute to maternal and fetal health development. It is recommended to conduct studies to determine microbiota awareness and influencing factors among expectant mothers with various characteristics (e.g., pregnancy complications, multiparity, history of preterm birth or abortion, obesity, etc.).

Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethics Committee Approval: Ethics committee approval was received for this study from the Human Research Ethics Committee of Nevşehir Hacı Bektaş Veli University (Date: 16.06.2023; Approval no.: 2023.06.16).

Informed Consent: Verbal consent was obtained from the participants in this study.

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