ORIGINAL RESEARCH

Midwives' knowledge and health guidance practices regarding gestational weight gain in Mongolia: A cross-sectional study

Aiko Tohara[1], Naoko Hikita*[1], Munkhchuluun Khadbaatar[2], Otgontogoo Oidovsuren[3], Hiromi Matsufuji[1], Yoko Sato[1], Yoshiko Suetsugu[1], Seiichi Morokuma[1], Bayasgalanmunkh Baatar[4]

[1] *Department of Health Sciences, Graduate School of Medical Sciences, Kyushu University, Fukuoka, Japan*
[2] *Clinical Department, Darkhan-Uul Medical School, Mongolian National University of Medical Sciences, Darkhan-Uul, Mongolia*
[3] *Division of Research and Information Technology, Darkhan-Uul Medical School, Mongolian National University of Medical Sciences, Darkhan-Uul, Mongolia*
[4] *Darkhan-Uul Medical School, Mongolian National University of Medical Sciences, Darkhan-Uul, Mongolia*

Received: October 14, 2025 **Accepted:** December 9, 2025 **Online Published:** December 23, 2025
DOI: 10.63564/jnep.v16n1p1 **URL:** https://doi.org/10.63564/jnep.v16n1p1

ABSTRACT

Objective: Excessive gestational weight gain (GWG) affects perinatal outcomes. However, to our knowledge, there are no studies on midwives' knowledge and health guidance practices regarding GWG in Mongolia. Therefore, this study aimed to investigate midwives' knowledge about weight control, clarify GWG guidance during pregnancy, and identify factors related to the implementation of GWG guidance in Mongolia.

Methods: A cross-sectional study using a web-based questionnaire was conducted among midwives registered with the Mongolian Midwives Association. The survey was conducted between July and August 2024. The questionnaire asked about calculating body mass index (BMI), BMI categories, and implementation of GWG health counseling. Multiple logistic regression analyses were conducted to identify factors associated with health guidance on GWG and BMI knowledge.

Results: A total of 414 responses were analyzed. Of the participants, 38.4% could correctly calculate BMI, and 37.7% could correctly answer what the BMI "normal weight" category was. Furthermore, 38.6% to 77.8% of midwives provided the 10 recommended health guidance items to more than 90% of pregnant women. Midwives working in hospital wards, those with fewer years of clinical experience, those who did not know how to calculate BMI, and those who did not have experience learning about weight control were associated with lower GWG health guidance scores.

Conclusions: This study clarified the health guidance practices regarding GWG and determined midwives' level of knowledge about weight control in Mongolia. Postgraduate education for midwives should be enhanced to improve health guidance for GWG in Mongolia.

Key Words: Gestational weight gain, Health guidance, Knowledge, Midwives, Mongolia

1. INTRODUCTION

Pre-pregnancy obesity has been shown to have a negative impact on maternal, fetal, and neonatal outcomes. Studies have reported that overweight and obese mothers have increased odds of cesarean section (CS) delivery, gestational diabetes, gestational hypertension, induction of labor, postpartum hemorrhage, pre-eclampsia, and pre-term premature rupture of membranes.[1,2] The reported effects on newborns include an increased risk of admission to the newborn intensive care unit, APGAR scores less than seven at five min, large for

*Correspondence: Naoko Hikita; Email: hikita.naoko.419@m.kyushu-u.ac.jp; Address: 3-1-1 Maidashi, Higashi-ku, Fukuoka, 812-8582, Japan.

gestational age (LGA), macrosomia, extreme pre-term birth, post-term birth, stillbirth, overweight, and obesity in later childhood.[1–3] Furthermore, excessive weight gain during pregnancy has been reported to adversely affect perinatal outcomes. Excess weight gain during pregnancy is associated with an increased risk of CS delivery, delivering macrosomia or LGA,[2,4] and long-term obesity in children.[3] It is also a risk factor for postpartum weight retention[5] and for transition to diabetes and hypertension.

In Mongolia, the average body mass index (BMI) among women is 25.9 kg/m^2, with the proportion of women found to be overweight and obese (BMI $\geq$ 25 kg/m^2) reaching 50.9%.[6] A study conducted in Mongolia reported that higher maternal BMI and higher gestational weight gain (GWG) are associated with CS delivery in Mongolia.[7] In fact, the CS delivery rate in Mongolia is 26.4%,[8] which is higher than the World Health Organizaion (WHO)-recommended CS delivery rate of 5%–15%.[8] Maternal obesity may be one of the reasons for a higher CS delivery rate in Mongolia. Therefore, proper weight control before and during pregnancy is important for the health of both mothers and babies.

Appropriate GWG during pregnancy is usually determined by pre-pregnancy BMI. In 2009, the Institute of Medicine (IOM) published guidelines on the recommended range of GWG based on maternal BMI.[9] It is recommended that those who provide prenatal care to women offer counseling, such as guidance on dietary intake and physical activity tailored to their life circumstances.[9] The following approaches are also recommended: "recording pre-pregnancy BMI," "charting weight gain throughout pregnancy," "sharing the results," "counseling women about healthy choices for diet and physical activity," and "referring women to a dietitian or physical activity specialist, if needed, for extra assistance".[10]

A study targeting healthcare providers reported that providing GWG guidance and discussing the risks of inappropriate GWG were related to their detailed knowledge of GWG, physical activity, and nutritional guidelines.[11] A systematic review of evidence on midwives' and obstetricians' knowledge of the GWG guidelines reported that their level of knowledge of the same is generally low.[12] However, there is no consensus as the guidelines used vary from country to country, and the evaluation methods vary from study to study.

In Mongolia, although the Ministry of Health has developed guidelines for antenatal care based on WHO recommendations,[13] the recommended amount of GWG has not been described. Thus, the way health guidance regarding GWG is provided may vary depending on the region, facility, and individual midwife. However, studies have not reported on the actual state of knowledge regarding weight control or health guidance for GWG.

Therefore, this study aimed to clarify the actual situation of GWG guidance by midwives in Mongolia, examine midwives' knowledge of weight control, and identify factors associated with their practice of GWG guidance. This study is novel as it is the first study to investigate these aspects in Mongolia's context. This study will help improve health guidance by clarifying midwives' knowledge and guidance implementation.

2. METHODS

2.1 Study design and participants

This cross-sectional study used a web-based questionnaire. Participants included approximately 1200 midwives registered with the Midwives' Association of Mongolia. Midwives who were on long vacations or otherwise unable to participate in the survey were excluded. Inclusion criteria of the analyses were midwives who had provided health guidance to pregnant women in outpatient or antenatal classes (group guidance).

2.2 Data collection

An email was sent to the director of the Mongolian Midwives' Association requesting their cooperation. The director sent emails to almost all medical facilities in the country, and midwives were informed about the study. Participants were asked to read the study description attached to the e-mail; if they agreed to participate, they were asked to access the web-based questionnaire via a QR code or URL attached to the document. After completing the questionnaire, the participants were asked to submit their responses online. The survey was conducted between July and August 2024.

2.3 Variables

2.3.1 *Participants' characteristics*

The following participant characteristics were obtained: age, sex (male, female), educational attainment (3-year diploma, 4-year degree), area of work, type of medical facility (primary, secondary, tertiary), working section (ward, outpatient, other), years of clinical experience, years of obstetric experience, number of assisted deliveries, overseas training experiences, height (cm), weight (kg), and experiences of learning about weight control. The BMI of the participants was calculated using their self-reported weight and height.

2.3.2 *Knowledge about BMI*

Participants were asked if they knew how to calculate their BMI. They were also asked to calculate their own BMI, and their calculations were evaluated for accuracy. Regarding

knowledge about BMI classification by the WHO, the participants were asked to provide the reference values of BMI for underweight, normal weight, overweight, and obese. The correct answers were as follows according to the WHO classification: BMI < 18.5 kg/m^2 (underweight), 18.5 kg/m^2 $\leq$ BMI < 25.0 kg/m^2 (normal weight), 25.0 kg/m^2 $\leq$ BMI < 30.0 kg/m^2 (overweight), and BMI $\geq$ 30.0 kg/m^2 (obesity).

2.3.3 *Practice of health guidance on GWG*

Based on a previous study,[11] we developed 10 health guidance items on GWG (see Table 1) and asked what percentage of pregnant women practiced them. The frequency options ranged from 0% to 100%.

Table 1. Health guidance items on GWG

1. I check the BMI of pregnant women at her first prenatal care
2. I provide pregnant women with a weight gain target based on their pre-pregnancy BMI
3. I discuss the recommended rate of weight gain (kg/week) based on their weight gain target
4. I discuss the impact that inappropriate weight gain can have on the mother during pregnancy
5. I discuss the impact that inappropriate weight gain can have on the baby
6. I weigh women at every visit
7. I relay weight gain information to women every time I weigh them
8. I discuss appropriate physical activity with pregnant women
9. I discuss appropriate extra food requirements with pregnant women
10. I can easily give examples of appropriate changes that women could make to meet extra food requirements

2.4 Definition of terms

In this study, the following definitions were used:

Able to calculate BMI: If participants were able to calculate their BMI correctly, they were considered to be "able to calculate BMI."

Having the knowledge of BMI categories: If participants could correctly answer the range of "normal weight" according to the WHO BMI classification, they were considered as "having the knowledge of BMI categories." This is because if they knew the range of "normal weight," they would understand the upper limit of "underweight" and the lower limit of "obesity."

Provide GWG health guidance: For the 10 health guidance items related to GWG, based on the results of a study, if participants answered that they provided health guidance to more than 90% of the pregnant women, we considered that the health guidance item was provided.[11] The health guidance items provided to pregnant women were counted; one item was counted as 1 point, whereas when the health guidance items were not provided to pregnant women, the item was counted as 0. Of the total health guidance score out of 10 points, scores above the average were defined as the "high score group," and scores below the average were defined as the "low score group."

2.5 Statistical analysis

For participants' characteristics and the situation of health guidance regarding GWG, continuous values were expressed as mean $\pm$ standard deviation, and categorical data were expressed as n (%). The numbers below the age at which a person could become a midwife were treated as missing values. If BMI could not be calculated owing to missing self-reported height and weight, it was considered a missing value and excluded from the analysis. In addition, participants' characteristics and health guidance situation regarding GWG were analyzed for significant differences between the two groups using the *t*-test for continuous variables and the chi-squared test or Fisher's exact test for categorical variables.

Multiple logistic regression analysis was performed to identify the factors related to low GWG health guidance scores. Variables related to BMI knowledge (if they knew how to calculate BMI, could calculate BMI correctly, and understood BMI categories); variables suggested in studies to be related to GWG health guidance; variables related to whether they had studied about GWG, if they had overseas training; and variables of basic characteristics were used as independent variables in the analysis.

In addition, multiple logistic regression analysis was conducted to identify factors related to incorrect BMI calculations. Variables related to knowledge of BMI categories, experience studying GWG, experience with overseas training, and basic characteristics were used as independent variables in the analysis.

Furthermore, multiple logistic regression analysis was conducted to identify factors related to poor knowledge of BMI categories. Variables related to BMI knowledge (if they knew how to calculate BMI and could calculate it correctly), if they had experience of studying GWG, if they had experience of overseas training, and basic characteristics were used as independent variables in the analysis.

Multicollinearity was not an issue for any model, with all tolerances > 0.455 and variance inflation factors < 2.20. All data were analyzed using IBM SPSS Statistics 29.0 for Windows (IBM Corp., Armonk, NY, USA). Two-tailed *p* values

of < .05 were considered statistically significant.

3. RESULTS

3.1 Participants' characteristics

Midwives nationwide were recruited, and 494 responded to the survey. Data from 10 duplicate responses were excluded. We excluded 70 midwives who indicated that they had never provided health guidance to pregnant women in outpatient or antenatal classes (group guidance). The final analysis included data from 414 participants.

Table 2. Characteristics of participants

Characteristics of participants	Total (n = 414)		Low score group (n = 221, 53.4%)		High score group (n = 193, 46.6%)		*p*
	n (%) or mean ± SD		n (%) or mean ± SD		n (%) or mean ± SD		
Age (years)	37.7	±10.5	37.0	±10.1	38.5	±10.8	
20–29	108	(26.1)	58	(53.7)	50	(46.3)	
30–39	167	(40.3)	95	(56.9)	72	(43.1)	.129*
40–49	39	(9.4)	21	(53.8)	18	(46.2)	.434*
50–	97	(23.4)	45	(46.4)	52	(53.6)	
Missing	3	(0.7)					
Sex							
Female	405	(97.8)	215	(53.1)	190	(46.9)	.320†
Male	9	(2.2)	6	(66.7)	3	(33.3)	
Educational attainment							
3-year diploma	150	(36.2)	76	(50.7)	74	(49.3)	.404
4-year degree	264	(63.8)	145	(54.9)	119	(45.1)	
Area of work							
Ulaanbaatar	99	(23.9)	61	(61.6)	38	(38.4)	.060
Other provinces	315	(76.1)	160	(50.8)	155	(49.2)	
Type of medical facility							
Primary	191	(46.1)	86	(45.0)	105	(55.0)	.002
Secondary	134	(32.4)	87	(64.9)	47	(35.1)	
Tertiary	89	(21.5)	48	(53.9)	41	(46.1)	
Working section							
Outpatient	168	(40.6)	74	(44.0)	94	(56.0)	< .001
Hospital ward	181	(43.7)	120	(66.3)	61	(33.7)	
Other sections	65	(15.7)	27	(41.5)	38	(58.5)	
Years of clinical experience	15.0	±11.0	14.3	±10.8	15.7	±11.2	
0–3	56	(13.5)	35	(62.5)	21	(37.5)	.190*
4–10	131	(31.6)	68	(51.9)	63	(48.1)	.341
11–	223	(53.9)	116	(52.0)	107	(48.0)	
Missing	4	(1.0)					
Years of obstetric experience	10.6	±10.1	10.5	±10.1	10.7	±10.2	
0–3	134	(32.4)	75	(56.0)	59	(44.0)	.794*
4–10	105	(25.4)	50	(47.6)	55	(52.4)	.377
11–	156	(37.7)	86	(55.1)	70	(44.9)	
Missing	19	(4.6)					
Number of assisted deliveries							
0–100	177	(42.8)	86	(48.6)	91	(51.4)	.474
101–500	74	(17.9)	42	(56.8)	32	(43.2)	
501–1000	37	(8.9)	20	(54.1)	17	(45.9)	
1001–	107	(25.8)	61	(57.0)	46	(43.0)	
Missing	19	(4.6)					
Overseas training experiences							
Experienced	68	(16.4)	40	(58.8)	28	(41.2)	.325
Not experienced	346	(83.6)	181	(52.3)	165	(47.7)	
Experience of learning about weight control							
Experienced	207	(50.0)	95	(45.9)	112	(54.1)	.002
Not experienced	207	(50.0)	126	(60.9)	81	(39.1)	
Do you know how to calculate BMI?							
Yes	374	(90.3)	189	(50.5)	185	(49.5)	< .001
No	40	(9.7)	32	(80.0)	8	(20.0)	
BMI calculation							
Correct	159	(38.4)	82	(51.6)	77	(48.4)	.606
Incorrect	251	(60.6)	136	(54.2)	115	(45.8)	
Missing	4	(1.0)					
Having knowledge about BMI category							
Yes	156	(37.7)	75	(48.1)	81	(51.9)	.092
No	258	(62.3)	146	(56.6)	112	(43.4)	

Notes. GWG: gestational weight gain; SD: standard deviation; BMI: body mass index; For the 10 health guidance items related to GWG, if participants answered that they provided health guidance to more than 90% of the pregnant women, the health guidance items were counted; 1 item was counted as 1 point. Of the total health guidance score out of 10 points, scores above six were defined as the "high score group," and scores below five were defined as the "low score group." Chi-squared test. *: *t*-test; †: Fisher's exact test.

Table 2 shows the participants' characteristics. The mean age of the participant population was 37.7 ± 10.5 years. Most participants were female (405, 97.8%); 264 (63.8%) had 4-year-degree educational status; 99 (23.9%) worked in Ulaanbaatar, the capital city of Mongolia; and 181 (43.7%) were currently working in the hospital ward. The mean clinical experience was 15.0 ± 11.0 years, and the mean years of obstetrics experience was 10.6 ± 10.1 years.

Although 374 (90.3%) participants indicated that they knew how to calculate their BMI, only 159 (38.4%) calculated it correctly. A total of 156 (37.7%) participants accurately identified the BMI categories.

3.2 Situation of GWG guidance

The practices of GWG guidance are presented in Table 3. The GWG guidance with highest and lowest rates of practice were "Weighing women at every visit" (322, 77.8%) and "discussing the recommended rate of weight gain (kg/week) based on their weight gain target" (160, 38.6%), respectively.

Table 3. Percentage of respondents providing health guidance to more than 90% of pregnant women (n = 414)

	n	(%)
I check the BMI of pregnant women at her first prenatal care	205	(49.5)
I provide pregnant women with a weight gain target based on their pre-pregnancy BMI	165	(39.9)
I discuss the recommended rate of weight gain (kg/week) based on their weight gain target	160	(38.6)
I discuss the impact that inappropriate weight gain can have on the mother during pregnancy	198	(47.8)
I discuss the impact that inappropriate weight gain can have on the baby	200	(48.3)
I weigh women at every visit	322	(77.8)
I relay weight gain information to women every time I weigh them	283	(68.4)
I discuss appropriate physical activity with pregnant women	216	(52.2)
I discuss appropriate extra food requirements with pregnant women	216	(52.2)
I can easily give examples of appropriate changes that women could make to meet extra food requirements	198	(47.8)

The average score of the GWG health guidance items provided to more than 90% of pregnant women was 5.2 point out of 10. Consequently, scores below five were classified as the low-scoring group, and scores above six were classified as the high-scoring group. A comparison of characteristics between the low and high GWG health guidance score groups revealed significant differences in the type of medical facility ($p = .002$), working section ($p < .001$), experience of learning GWG ($p = .002$), and "Do you know how to calculate BMI?" ($p < .001$) (see Table 2).

3.3 Factors related to low scores of GWG health guidance

Table 4 shows factors related to low scores of GWG health guidance. Compared to midwives working at outpatient departments, those working at wards had higher risk of having a low score of GWG health guidance (adjusted odds ratio [AOR]: 2.96, 95% confidence interval [CI]: 1.78–4.92). Moreover, compared to midwives with 11 or more years of clinical experience, those with three or fewer years had a higher risk for a low score of GWG health guidance (AOR: 2.82, 95% CI: 1.03–7.69). Compared to midwives who answered that they knew how to calculate BMI, those who answered that they did not had a higher risk of a low score of GWG health guidance (AOR: 3.10, 95% CI: 1.30–7.39). In addition, compared to midwives who responded that they had experience of learning weight control, those who responded they did not had a higher risk for a low score of GWG health guidance (AOR: 2.09, 95% CI: 1.34–3.25).

3.4 Factors related to incorrect BMI calculations

Table 5 shows factors related to incorrect BMI calculation. Compared to midwives who had knowledge about BMI category, those who had poor knowledge had a higher risk of incorrect BMI calculations (AOR: 2.15, 95% CI: 1.39–3.32).

3.5 Factors related to poor knowledge of BMI categories

Table 6 shows factors related to poor knowledge of BMI categories. Compared to midwives with three or fewer years of clinical experience, those with 4–10 years had a higher risk of poor knowledge of BMI categories (AOR: 2.56, 95% CI: 1.20–5.44). Moreover, compared to midwives who had experience of training overseas, those who had never trained overseas had a higher risk of poor knowledge of BMI categories (AOR: 1.80, 95% CI: 1.01–3.19). Compared to midwives who responded that they know how to calculate BMI, those who responded they did not had a higher risk of poor knowledge of BMI categories (AOR: 3.73, 95% CI: 1.36–10.22). Additionally, compared to those who accurately calculated BMI, those who did not were at a higher risk of poor knowledge of BMI categories (AOR: 1.84, 95% CI: 1.18–2.87).

Table 4. Factors related to low scores of GWG health guidance

Variables	COR	(95% CI)	*p*	AOR	(95% CI)	*p*
Age (years)						
20–29	Reference			Reference		
30–39	1.14	(0.70–1.85)	.604	1.60	(0.79–3.25)	.191
40–49	1.01	(0.48–2.10)	.988	1.80	(0.61–5.29)	.289
50–	0.75	(0.43–1.29)	.296	1.42	(0.54–3.70)	.475
Educational status						
3-year diploma	Reference			Reference		
4-year degree	1.19	(0.79–1.77)	.404	0.94	(0.57–1.56)	.810
Area of work						
Ulaanbaatar	Reference			Reference		
Other provinces	0.64	(0.45–1.02)	.061	1.11	(0.65–1.92)	.697
Working section						
Outpatient	Reference			Reference		
Hospital ward	2.50	(1.62–3.85)	< .001	2.96	(1.78–4.92)	< .001
Other sections	0.90	(0.51–1.61)	.729	1.10	(0.58–2.07)	.772
Years of clinical experience						
0–3	1.54	(0.84–2.81)	.161	2.82	(1.03–7.69)	.043
4–10	1.00	(0.65–1.53)	.984	1.29	(0.66–2.52)	.465
11–	Reference			Reference		
Overseas training experiences						
Experienced	Reference			Reference		
Not experienced	0.77	(0.45–1.30)	.326	0.64	(0.35–1.16)	.140
Do you know how to calculate BMI?						
Yes	Reference			Reference		
No	3.92	(1.76–8.72)	< .001	3.10	(1.30–7.39)	.010
BMI calculation						
Correct	Reference			Reference		
Incorrect	1.11	(0.75–1.65)	.606	0.79	(0.50–1.24)	.299
Having knowledge about BMI category						
Yes	Reference			Reference		
No	1.41	(0.95–2.10)	.093	1.44	(0.92–2.25)	.113
Experience of learning about weight control						
Experienced	Reference			Reference		
Not experienced	1.83	(1.24–2.71)	.002	2.09	(1.34–3.25)	.001

Notes. GWG: gestational weight gain; COR: crude odds ratio; AOR: adjusted odds ratio; CI: confidence interval; BMI: body mass index
For the 10 health guidance items related to GWG, if participants answered that they provided health guidance to more than 90% of the pregnant women, the health guidance items were counted; 1 item was counted as 1 point. Of the total health guidance score out of 10 points, scores above six were defined as the "high score group," and scores below five were defined as the "low score group." Multiple logistic regression analysis adjusted for all variables in the table was conducted.

4. DISCUSSION

4.1 Situation of GWG guidance

In this study, although 90.3% of the participants indicated that they knew how to calculate BMI, 38.4% were able to do it correctly, and 37.7% had knowledge about BMI categories. In a study conducted in Australia, 11.9% of the participants were able to correctly answer the range of "normal weight";[14] thus, the correct answer ratio of our participants (37.7%) was higher than that of the previous study, although the percentage is still low.

Table 5. Factors related to incorrect BMI calculations

Variables	COR	(95%CI)	*p*	AOR	(95%CI)	*p*
Age (years)						
20–29	Reference			Reference		
30–39	1.60	(0.97–2.64)	.068	1.60	(0.78–3.24)	.197
40–49	1.37	(0.63–2.97)	.426	1.89	(0.63–5.60)	.254
50–	0.76	(0.44–1.32)	.327	0.86	(0.33–2.23)	.751
Educational status						
3-year diploma	Reference			Reference		
4-year degree	1.19	(0.79–1.80)	.399	0.99	(0.60–1.64)	.970
Area of work						
Ulaanbaatar	Reference			Reference		
Other provinces	0.71	(0.44–1.14)	.155	0.73	(0.42–1.26)	.261
Working section						
Outpatient	Reference			Reference		
Hospital ward	1.27	(0.82–1.96)	.281	1.21	(0.74–1.98)	.449
Other sections	0.99	(0.55–1.77)	.964	1.23	(0.65–2.33)	.527
Years of clinical experience						
0–3	Reference			Reference		
4–10	1.84	(0.97–3.49)	.063	1.32	(0.62–2.79)	.474
11–	1.29	(0.72–2.33)	.398	1.00	(0.38–2.69)	.955
Overseas training experiences						
Experienced	Reference			Reference		
Not experienced	0.90	(0.53–1.55)	.709	0.76	(0.42–1.37)	.362
Having knowledge about BMI category						
Yes	Reference			Reference		
No	2.14	(1.42–3.22)	< .001	2.15	(1.39–3.32)	.001
Experience of learning about weight control						
Experienced	Reference			Reference		
Not experienced	1.57	(1.05–2.34)	.028	1.51	(0.98–2.33	.060

Notes. BMI: body mass index; COR: crude odds ratio; AOR: adjusted odds ratio; CI: confidence interval; Multiple logistic regression analysis adjusted for all variables in the table was conducted.

In this study, 49.5% of participants had practiced the item of "Checking the BMI of pregnant women at her first prenatal care," and 39.9% had practiced the item "Providing pregnant women with a weight gain target based on their pre-pregnancy BMI." However, only a few participants had correct knowledge about BMI calculations and BMI categories, suggesting that some midwives may provide GWG health guidance to pregnant women based on incorrect BMI values. In the present study, 77.8% of participants answered that the item "Weighing women at every visit" was implemented for more than 90% of the pregnant women. This is similar to the results of a study in Canada in which 76% of the respondents practiced it.[11] Meanwhile, some items such as "Providing pregnant women with a weight gain target based on their pre-pregnancy BMI," "Discussing the recommended rate of weight gain (kg/week) based on their weight gain target," and "Discussing the impact that inappropriate weight gain can have on the mother during pregnancy" were practiced with higher percentage than those in study.[11]

A study conducted among obstetricians and gynecologists showed that 79.2% practiced "Calculate BMI at first prenatal visit" and 78.2% practiced "Use BMI to modify weight gain recommendations," which was higher than the results of this study.[15] However, because this study had only two answer options, "yes" or "no," it is likely that the percentage of participants who answered that they provide health guidance was higher, and the results cannot be compared simply.

Table 6. Factors related to poor knowledge of BMI categories

Variables	COR	(95%CI)	*p*	AOR	(95%CI)	*p*
Age (years)						
20–29	Reference			Reference		
30–39	1.53	(0.93–2.51)	.096	1.11	(0.54–2.27)	.778
40–49	1.00	(0.48–2.09)	.994	0.64	(0.22–1.88)	.416
50–	1.36	(0.78–2.40)	.278	1.30	(0.49–3.44)	.595
Educational status						
3-year diploma	Reference			Reference		
4-year degree	0.85	(0.56–1.30)	.458	0.84	(0.51–1.41)	.515
Area of work						
Ulaanbaatar	Reference			Reference		
Other provinces	0.88	(0.55–1.40)	.584	0.88	(0.51–1.51)	.637
Working section						
Outpatient	Reference			Reference		
Hospital ward	1.07	(0.70–1.66)	.747	1.08	(0.65–1.79)	.766
Other sections	1.08	(0.60–1.95)	.803	1.00	(0.53–1.91)	.989
Years of clinical experience						
0–3	Reference			Reference		
4–10	2.36	(1.24–4.48)	.009	2.56	(1.20–5.44)	.015
11–	1.81	(1.00–3.27)	.048	1.97	(0.73–5.30)	.181
Overseas training experiences						
Experienced	Reference			Reference		
Not experienced	1.71	(1.01–2.89)	.045	1.80	(1.01–3.19)	.046
Do you know how to calculate BMI?						
Yes	Reference			Reference		
No	4.74	(1.82–12.37)	.001	3.73	(1.36–10.22)	.010
BMI calculation						
Correct	Reference			Reference		
Incorrect	2.14	(1.42–3.22)	< .001	1.84	(1.18–2.87)	.007
Experience of learning about weight control						
Experienced	Reference			Reference		
Not experienced	1.09	(0.73–1.62)	.685	0.86	(0.55–1.33)	.495

Notes. BMI: body mass index; COR: crude odds ratio; AOR: adjusted odds ratio; CI: confidence interval; Multiple logistic regression analysis adjusted for all variables in the table was conducted.

This study clarified that several midwives provide health guidance for GWG based on pre-pregnancy BMI; however, there are currently no standardized guidelines for recommended weight gain in Mongolia. Therefore, it is necessary to develop guidelines for recommended weight gain adjusted for pregnant Mongolian women, considering their race and skeletal structure. However, further studies are required to validate these guidelines.

4.2 Factors related to BMI knowledge

Compared to midwives with three or fewer years of clinical experience, those with 4–10 years had a 2.56 times higher risk of having poor knowledge about BMI categories. Although we expected that midwives with more years of clinical experience would have more knowledge of BMI categories, the results were the opposite. Meanwhile, no significant differences were observed between midwives with less than three years and those with more than 11 years of clinical experience. A possible reason for this is that midwives with more than 11 years of clinical experience are at an age when obesity is more prevalent;[16] thus, they may be more aware and knowledgeable about BMI.

It was also found that midwives who had no experience of

training overseas had 1.80 times higher risk of having poor knowledge of BMI categories than those who had experience of training overseas. It is assumed that midwives with overseas training experience have more opportunities to gain knowledge. These findings suggest that in addition to learning about BMI as a basic nursing and midwifery education course, it is necessary to improve post-graduate education so midwives can maintain their knowledge through regular training and other programs after graduation. In Mongolia, medical licenses, including midwifery licenses, are renewed every five years and require participation in lectures and training programs to obtain the necessary credit.[17] Therefore, it may be necessary to maintain midwives' knowledge by providing training on BMI and weight control or other measures.

This study identified the factors contributing to lower health guidance scores on the GWG as working in a ward, having less than three years of clinical experience, and having no experience learning about weight control. Those working in wards have fewer opportunities to provide health guidance on GWG than those working in outpatient departments, which may mean that their knowledge of health guidance is not updated or that they give less priority to GWG health guidance.

Participants who did not know how to calculate BMI had an approximately three times higher risk of having a low health guidance score than those who did. Studies have reported that being aware of IOM recommendations is associated with both frequently or always calculating BMI at the first prenatal visit and modifying weight gain recommendations using BMI; further, individuals who are aware of IOM recommendations are more likely to frequently or always counsel patients about GWG.[15] Moreover, those who are aware of IOM recommendations are more likely to inform pregnant women that excessive weight gain increases the risk of pregnancy complications and may adversely affect their fetal health.[15] Therefore, the awareness of BMI and its guidelines may be associated with health guidance practices. All midwives must understand how to calculate BMI because without such awareness, providing appropriate health guidance on GWG is not possible.

4.3 Strengths and limitations

The strength of this study is that it is the first to investigate midwives' knowledge of GWG, health guidance, and factors related to GWG health guidance in Mongolia. Additionally, our survey was conducted among midwives across Mongolia. As there are differences in population distribution[18] and access to healthcare[19] between Ulaanbaatar and other provinces, targeting midwives in all regions would have captured the differences in both urban and rural characteristics.

However, this study has some limitations. First, information about the practice of health guidance regarding GWG was self-reported and does not reflect the actual practice or the accuracy of its content. Additionally, participants could have been subjected to social desirability bias, leading them to describe their health guidance implementation in a better way than what is actually the case. Second, the health guidance score of the GWG used in this study was not a scale that had been tested for reliability and validity; therefore, interpretation of the actual situation of GWG health guidance should be performed carefully. However, the 10 items regarding health guidance used in this study were also used in previous studies, which is a strength, as it allows for comparison with previous studies. Third, because this study used a web questionnaire, the target population may have been limited to Internet users. However, because Mongolia has a high Internet penetration rate of 83.91%,[20] and each medical facility is equipped with a computer connected to the Internet, the number of participants who were unable to participate due to a lack of Internet access is expected to be minimal. Fourth, fewer participants were in their 20s and more were in their 50s or older than the general population. Therefore, the generalizability of our results is limited.

5. Conclusions

This study clarified the status of GWG health guidance and knowledge of BMI among Mongolian midwives. The percentage of midwives who were able to correctly calculate BMI was 38.4%, while 37.7% had knowledge about BMI categories. Factors related to low GWG health guidance scores included working in hospital wards, fewer years of clinical experience, lack of knowledge about BMI, and lack of experience in learning about weight control. To improve GWG health guidelines, post-graduate education for midwives must be improved. Further research is needed to develop GWG guidelines tailored to the Mongolian population.

Acknowledgements

We thank Ms. Davaasuren, President of the Mongolian Midwives Association, and all members for their willingness to cooperate and provide valuable answers to our questions.

Authors contributions

A.T. and N.H. designed the study, the main conceptual ideas, and the proof outline. A.T. and N.H. collected the data. A.T., N.H., M.K., O.O., and B.B. prepared document for ethical review. A.T., N.H., H.M., Y.S., Y.S., and S.M. aided in interpreting the results and worked on the manuscript. N.H., O.O., and B.B. supervised the project. A.T. wrote the manuscript

with support from N.H. All authors discussed the results and commented on the manuscript.

FUNDING
This work was supported by JSPS KAKENHI (grant number 23K16457). The funders were not involved in the study design; collection, analysis, and interpretation of data; writing of the report; or decision to submit the article for publication.

CONFLICTS OF INTEREST DISCLOSURE
The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

INFORMED CONSENT
Obtained.

ETHICS APPROVAL
The Publication Ethics Committee of the Association for Health Sciences and Education. The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

PROVENANCE AND PEER REVIEW
Not commissioned; externally double-blind peer reviewed.

DATA AVAILABILITY STATEMENT
The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

DATA SHARING STATEMENT
No additional data are available.

REFERENCES

[1] Vats H, Saxena R, Sachdeva MP, et al. Impact of maternal pre-pregnancy body mass index on maternal, fetal and neonatal adverse outcomes in the worldwide populations: A systematic review and meta-analysis. Obes Res Clin Pract. 2021; 15(6): 536-545. PMid:34782256 https://doi.org/10.1016/j.orcp.2021.10.005

[2] Sun Y, Shen Z, Zhan Y, et al. Effects of pre-pregnancy body mass index and gestational weight gain on maternal and infant complications. BMC Pregnancy Childbirth. 2020; 20(1): 390. PMid:32631269 https://doi.org/10.1186/s12884-020-03071-y

[3] Robinson SM, Crozier SR, Harvey NC, et al. Modifiable early-life risk factors for childhood adiposity and overweight: an analysis of their combined impact and potential for prevention. Am J Clin Nutr. 2015; 101(2): 368-75. PMid:25646335 https://doi.org/10.3945/ajcn.114.094268

[4] Goldstein RF, Abell SK, Ranasinha S, et al. Association of gestational weight gain with maternal and infant outcomes: A systematic review and meta-analysis. JAMA. 2017; 317(21): 2207-2225. PMid:28586887 https://doi.org/10.1001/jama.2017.3635

[5] Rong K, Yu K, Han X, et al. Pre-pregnancy BMI, gestational weight gain and postpartum weight retention: a meta-analysis of observational studies. Public Health Nutr. 2015; 18(12): 2172-82. PMid:25411780 https://doi.org/10.1017/S1368980014002523

[6] World Health Organization. Fourth national STEPS Survey on the Prevalence of Noncommunicable Disease and Injury Risk Factors-2019, [cited 2025 October 13]. Available from: https://cdn.who.int/media/docs/default-source/ncds/ncd-surveillance/data-reporting/mongolia/mongolia-steps-survey---2019_brief-summary_english.pdf?sfvrsn=5ba7a1d3_1&download=true

[7] Hikita N, Haruna M, Matsuzaki M, et al. Is high maternal body mass index associated with cesarean section delivery in Mongolia? A prospective observational study. Asian Pac Isl Nurs J. 2019; 4(3): 128-134. PMid:31583268 https://doi.org/10.31372/20190403.1056

[8] Center for Health Development. HEALTH INDICATORS, 2020 [cited 2025 October 13]. Available from: http://hdc.gov.mn/media/uploads/2022-05/health_indicator_2020_ENG.pdf

[9] Institute of Medicine (US) and National Research Council (US) Committee to Reexamine IOM Pregnancy Weight Guidelines. Weight Gain During Pregnancy: Reexamining the Guidelines. Rasmussen KM, Yaktine AL, editors. Washington (DC): National Academies Press (US); 2009. Available from: https://nap.nationalacademies.org/catalog/12584/weight-gain-during-pregnancy-reexamining-the-guidelines

[10] Institute of Medicine and National Research Council. Implementing guidelines on weight gain and pregnancy. 2013; 17p.

[11] Morris J, Nikolopoulos H, Berry T, et al. Healthcare providers' gestational weight gain counselling practices and the influence of knowledge and attitudes: a cross-sectional mixed methods study. BMJ Open. 2017; 7(11): e018527. PMid:29138209 https://doi.org/10.1136/bmjopen-2017-018527

[12] Callaghan S, O'Brien E, Coughlan B, et al. Midwives' and obstetricians' level of knowledge of appropriate gestational weight gain recommendations for pregnancy: A systematic review. Birth. 2020; 47(4): 322-331. PMid:32253784 https://doi.org/10.1111/birt.12485

[13] World Health Organization. WHO Recommendations on Antenatal Care for a Positive Pregnancy Experience. Geneva, 2016. Available from: https://iris.who.int/server/api/core/bitstreams/9dccde13-3593-4a22-9237-61abe5a3c6b7/content

[14] Wilkinson SA, Stapleton H. Overweight and obesity in pregnancy: the evidence-practice gap in staff knowledge, attitudes and practices. Aust NZJ Obstet Gynaecol. 2012; 52(6): 588-92. PMid:23216325 https://doi.org/10.1111/ajo.12011

[15] Power ML, Schulkin J. Obstetrician/Gynecologists' Knowledge, Attitudes, and Practices Regarding Weight Gain During Pregnancy. J Womens Health (Larchmt). 2017; 26(11): 1169-1175. PMid:28604154 https://doi.org/10.1089/jwh.2016.6236

[16] Bromage S, Daria T, Lander RL, et al. Diet and Nutrition Status of Mongolian Adults. Nutrients. 2020; 12(5): 1514. PMid:32456038 https://doi.org/10.3390/nu12051514

[17] Unified legal information system. Procedures for organizing permit examinations, calculating time off, issuing permit certificates, and reimbursement. 2025. Available from: https://legalinfo.mn/mn/detail?lawId=16760195960811&showType=1

[18] Ministry of Foreign Affairs of Japan. Basic data of Mongolia. 2024. Available from: https://www.mofa.go.jp/mofaj/area/mongolia/data.html

[19] Erdenee O, Tumejargal A, Parchaa T, et al. Distribution of midwives in Mongolia: A secondary data analysis. Midwifery. 2020; 86: 102704. PMid:32208230 https://doi.org/10.1016/j.midw.2020.102704

[20] Global Note. Worldwide Internet penetration rates: Ranking by country and trends. 2025. Available from: https://www.globalnote.jp/post-1437.html