Received: 12 March 2023 / Accepted: 28 April 2023 / Published online: 30 April 2023

DOI 10.34689/SH.2023.25.2.014

UDC 618.143+616.2(084.21)

EFFECT OF MATERNAL PARITY AND AGE ON UTERINE FUNDAL HEIGHT DURING PREGNANCY AND THEIR APPLICATION IN PERSONALISED STANDARDS

Meruert G. Sharipova[1], https://orcid.org/0000-0002-5009-7387
Gulyash A. Tanysheva[1], https://orcid.org/0000-0001-9531-5950
Anar S. Kystaubayeva[2], https://orcid.org/0000-0002-8712-3307
Aizhan T. Shakhanova[1], http://orcid.org/0000-0001-8214-8575
Zaituna G. Khamidullina[3], https://orcid.org/0000-0002-5324-8486
Zhanylsyn A. Ryspayeva[1], https://orcid.org/0000-0003-1748-6548
Khalida K. Sharipova[3], https://orcid.org/0000-0001-5553-8156

[1] NJSC «Semey Medical University», Semey, Republic of Kazakhstan;
[2] Multi-profile city hospital No. 3 of Astana Akimat, Astana, Republic of Kazakhstan;
[3] NJSC «Astana Medical University», Astana, Republic of Kazakhstan.

Summary

Introduction: The most available screening method for detecting intrauterine fetal growth restriction is a graph of uterine fundal height (FH) during pregnancy (gravidogram). Customized charts with indicators adjusted for ethnicity, age, parity, maternal anthropometric characteristics (height, weight, BMI), parity, pregnancy complications, morbid background, social factors.

Aim: To investigate the effect of maternal characteristics (age and parity) on (FH) during pregnancy, to detect fetal growth restriction.

Materials and Methods: The study design was a single-stage retrospective cross-sectional study. *Inclusion criteria for the study were:* presence of first trimester ultrasound screening at 10-14 weeks' gestation, uncomplicated pregnancy, singleton pregnancy. *Exclusion criteria:* multiple pregnancies, breech presentation, malposition (transverse, oblique), fetal weight up to 2500 grams and over 4000 grams, premature birth, hypertensive states, antepartum fetal death, abnormal fetal growth, abundant water, small water, extragenital pathology.

Results: We sampled 3,886 cases of term pregnancies in the cephalic presentation, which ended with a live birth weight of 2,500 to 4,000 grams. When the mean FH values were assessed by age group, significant differences were found at 26, 28, 31-32, 35, and 38 weeks of gestation. It was also found that with an increase in maternal age by 1 year one should expect an increase in FH at weeks 26, 28, 31, 35, 38 and 41 by 0.047 cm; 0.055 cm; 0.049 cm; 0.063 cm; 0.049 cm; 0.057 cm and 0.067 cm. When comparing the mean FH values by maternal parity group, the FH values were found to be higher at 26 to 27, 30 to 35, 37 to 38, and 41 weeks of gestation, and the FH values increased with each successive pregnancy. Using linear regression, it was found that at weeks 31 - 33, 35 weeks of gestation an increase in FH of 0.208 cm; 0.254 cm; 0.154 cm; 0.189 cm should be expected at weeks 38, 40 - 42 weeks, an increase in FH of 0.189 cm; 0.188 cm; 0.576 cm; 7.845 cm should be expected at weeks 38, 40 - 42 weeks.

Conclusions: Maternal age and maternal parity variables are influential factors on uterine fundal height during pregnancy after 31 weeks gestation.

Key words: *uterine fundal height, parity, fetal growth restriction, customized charts, pregnancy.*

Резюме

ВЛИЯНИЕ ПАРИТЕТА И ВОЗРАСТА МАТЕРИ НА РОСТ ВЫСОТЫ СТОЯНИЯ ДНА МАТКИ ВО ВРЕМЯ БЕРЕМЕННОСТИ И ПРИМЕНЕНИЕ ИХ В ПЕРСОНАЛИЗИРОВАННЫХ СТАНДАРТАХ

Меруерт Г. Шарипова[1], https://orcid.org/0000-0002-5009-7387
Гульяш А. Танышева[1], https://orcid.org/0000-0001-9531-5950
Анар С. Кыстаубаева[2], https://orcid.org/0000-0002-8712-3307
Айжан Т. Шаханова[1], http://orcid.org/0000-0001-8214-8575
Зайтуна Г. Хамидуллина[3], https://orcid.org/0000-0002-5324-8486
Жанылсын А. Рыспаева[1], https://orcid.org/0000-0003-1748-6548
Халида К. Шарипова[3], https://orcid.org/0000-0001-5553-8156

[1] НАО «Медицинский университет Семей», г. Семей, Республика Казахстан;
[2] ГКП на ПХВ «Многопрофильная городская больница №3 акимата г. Астана»,

г. Астана, Республика Казахстан;
[3] **НАО «Медицинский университет Астана», г. Астана, Республика Казахстан.**

Введение: Наиболее доступным скрининговым методом выявления задержки внутриутробного развития плода является график роста высоты стояния дна матки (ВДМ) во время беременности (гравидограмма). Персонализированные графики, показатели которых скорректированы с учетом этнической принадлежности, возраста, паритета, антропометрических характеристик матери (рост, вес, индекс массы тела), осложнений беременности, морбидного фона, социальных факторов.

Цель: Изучить влияние характеристик матери (возраста и паритета) на ВДМ во время беременности, для выявления нарушений роста плода.

Материалы и методы: Дизайн исследования - одномоментное ретроспективное поперечное исследование. *Критериями включения* в исследование являлись: наличие УЗИ скрининга первого триместра беременности в сроке 10-14 недель, неосложненное течение беременности, одноплодная беременность. *Критерии исключения:* многоплодная беременность, тазовое предлежание плода, неправильные положения плода (поперечное, косое), вес плода до 2500 грамм и свыше 4000 граммов, преждевременные роды, гипертензивные состояния, антенатальная гибель плода, ВПР плода, многоводие, маловодие, экстрагенитальная патология.

Результаты: Нами были отобраны 3886 случаев доношенной беременности в головном предлежании, закончившейся рождением живого плода с массой от 2500 до 4000 граммов. При оценке средних величин ВДМ в зависимости от возрастных групп были выявлены значимые различия в сроках 26, 28, 31 – 32, 35, 38 недель беременности. Также были выявлено, что при увеличении возраста матери на 1 год следует ожидать увеличение ВДМ в сроках 26, 28, 31, 35, 38 и 41 недель на 0,047 см; 0,055 см; 0,049 см; 0,063 см; 0,049 см; 0,057 см и 0,067 см. При сравнении средних величин ВДМ по группам паритета матери, было обнаружено, что в сроках 26 – 27, 30 – 35, 37 – 38, 41 недель беременности величины ВДМ были выше, и с каждой последующей беременностью величины ВДМ повышались. С помощью линейной регрессии выявлено, что при увеличении паритета на 1 роды следует ожидать увеличение ВДМ 31-33, 35 неделях на 0,208 см; 0,254 см; 0,154 см; 0,189 см, а в сроках 38, 40-42 неделях - на 0,189 см; 0,188 см; 0,576 см; 7,845 см.

Выводы: Переменные возраст и паритет матери являются влияющими факторами на высоту стояния дна матки во время беременности после 31 недель гестации.

Ключевые слова: *высота стояния дна матки, паритет, нарушения роста плода, персонализированные графики, беременность.*

Түйіндеме

ЖҮКТІЛІК КЕЗІНДЕГІ ЖАТЫР ТҮБІНІҢ ТҰРУ БИІКТІГІНЕ АНАСЫНЫҢ ЖАСЫ МЕН ПАРИТЕТІНІҢ ӘСЕРІ ЖӘНЕ ОЛАРДЫ ЖЕКЕЛЕНГЕН СТАНДАРТТАРДА ҚОЛДАНУ

Меруерт Г. Шарипова[1], https://orcid.org/0000-0002-5009-7387
Гульяш А. Танышева[1], https://orcid.org/0000-0001-9531-5950
Анар С. Кыстаубаева[2], https://orcid.org/0000-0002-8712-3307
Айжан Т. Шаханова[1], http://orcid.org/0000-0001-8214-8575
Зайтуна Г. Хамидуллина[3], https://orcid.org/0000-0002-5324-8486
Жанылсын А. Рыспаева[1], https://orcid.org/0000-0003-1748-6548
Халида К. Шарипова[3], https://orcid.org/0000-0001-5553-8156

[1] **«Семей Медицина Университеті» КеАҚ, Семей қ., Қазақстан Республикасы;**
[2] **ШЖҚ МКК «Астана қала әкімдігінің №3 Көп профильді қалалық аурухана», Астана қ., Қазақстан Республикасы;**
[3] **«Астана Медицина Университеті» КеАҚ, Астана қ., Қазақстан Республикасы.**

Кіріспе: Ұрықтың жатырішілік дамуының тежелуінің ең қолжетімді скрининг әдісіне жүктілік кезінде жатыр түбінің тұру биіктігінің (ЖТТБ) өсу графигі (гравидограмма) жатады. Жекеленген графиктер көрсеткіштері анасының этносына, жасына, паритетіне, антрометриялық сипатына (бойы, салмағы, дене салмақ индексі), жүктілік асқынулары, морбидті фоны, әлеуметтік факторларына байланысты ескеріп тұрғызылады.

Мақсаты: Ұрықтың даму бұзылыстарын анықтау үшін жүктілік кезінде ЖТТБ анасының сипаттамаларының (жасы мен паритет) әсерін зерттеу.

Материалдар мен тәсілдер: Зерттеу дизайны – бір мезетті ретроспективті көлденең зерттеу. *Зерттеуге қосу критерийлеріне жатады:* жүктіліктің алғашқы үш айында 10-14 апта мерзімдегі УДЗ скрининг болуы, жүктіліктің асқынбаған ағымы, бір ұрықты жүктілік. *Зерттеуге қоспау критерийлері:* көп ұрықты жүктілік, ұрықтың жамбаспен орналасуы, ұрықтың дұрыс емес жағдайда орналасуы (көлденең, қиғаш), ұрықтың салмағы 2500 грамм дейін немесе 4000 граммнан жоғары, уақытынан ерте босану, гипертензиялық жағдайлар, ұрықтың антенаталды өлуі, ұрықтың жатырішілік ақаулары, қағанақ суының көптігі, қағанақ суының аздығы, экстрагениталды патология.

Нәтижелер: Біз дене салмағы 2500 мен 4000 грамм арасында тірі ұрық тууымен аяқталған ұрық басымен орналасқан толық жетілген жүктіліктің 3886 жағдайын таңдап алдық. Анасының жасы топтары бойынша ЖТТБ орташа өлшемдерін салыстырған кезде жүктіліктің 26, 28, 31 – 32, 35, 38 апталарында айқын айырмашылықтар анықталды. Сонымен қатар, анасының жасы 1 жылға артқан кезде жүктіліктің 26, 28, 31, 35, 38 мен 41 апталарында ЖТТБ өлшемдері 0,047 см; 0,055 см; 0,049 см; 0,063 см; 0,049 см; 0,057 см мен 0,067 см артатыны анықталды. Анасының паритет топтары бойынша ЖТТБ орташа өлшемдерін салыстырған кезде жүктіліктің 26 – 27, 30 – 35, 37 – 38, 41 апта мерзімдерінде ЖТТБ өлшемі артқан, яғни әрбір келесі жүктілікпен ЖТТБ өлшемі артқан. Сызықты регрессия көмегімен анасының 1 босануға артқан кезде жүктіліктің 31-33, 35 апталарында ЖТТБ өлшемдерінің 0,208 см; 0,254 см; 0,154 см; 0,189 см артуын, ал 38, 40-42 апталарда - 0,189 см; 0,188 см; 0,576 см; 7,845 см артуын болжауға мүмкіндік беретіні анықталды.

Қорытынды: Анасының жасы мен паритеті ауысымдары жүктілік кезінде гестацияның 31 аптасынан кейін жатыр түбінің тұру биіктігіне әсер ететін факторларға жатады.

Түйінді сөздер: *жатыр түбінің тұру биіктігі, паритет, ұрық дамуының бұзылуы, жекеленген графиктер, жүктілік.*

Bibliographic citation:

Sharipova M.G., Tanysheva G.A., Kystaubayeva A.S., Shakhanova A.T., Khamidullina Z.G., Ryspayeva Zh.A., Sharipova Kh.K. Effect of maternal parity and age on uterine fundal height during pregnancy and their application in personalised standards // *Nauka i Zdravookhranenie* [Science & Healthcare]. 2023, (Vol.25) 2, pp. 97-104. *doi 10.34689/SH.2023.25.2.014*

Шарипова М.Г., Таньшева Г.А., Кыстаубаева А.С., Шаханова А.Т., Хамидуллина З.Г., Рыспаева Ж.А., Шарипова Х.К. Влияние паритета и возраста матери на рост высоты стояния дна матки во время беременности и применение их в персонализированных стандартах // Наука и Здравоохранение. 2023. 2(Т.25). С. 97-104. *doi 10.34689/SH.2023.25.2.014*

Шарипова М.Г., Таньшева Г.А., Кыстаубаева А.С., Шаханова А.Т., Хамидуллина З.Г., Рыспаева Ж.А., Шарипова Х.К. Жүктілік кезіндегі жатыр түбінің тұру биіктігіне анасының жасы мен паритетінің әсері және оларды жекеленген стандарттарда қолдану // Ғылым және Денсаулық сақтау. 2023. 2 (Т.25). Б. 97-104. *doi 10.34689/SH.2023.25.2.014*

Introduction

Improvement of antenatal care, prevention and reduction of perinatal losses are the main priority of modern obstetrics, both in the Republic of Kazakhstan and around the world. Timely and high-quality obstetric care is the main and important condition for the detection of pregnancy complications. Improving the quality of antenatal care and earlier identification of stillbirth risk factors reduces perinatal losses and improves pregnancy outcomes [1]. Perinatal mortality is closely related to the quality of antenatal care, medical interventions and the condition of the newborn at birth [13].

One of the main problems of antenatal care is the early detection of fetal growth disorders using available methods. Forecasting and timely detection of fetal growth retardation (FGR) is a significant parameter that directly affects the perinatal mortality rate. The most accessible screening method is a graph of the growth of the height of the uterine fundus (FH) during pregnancy (gravidogram). To assess the antenatal growth of the fetus, certain countries use population graphs, a number of countries use individualized (personalized) graph models. A population gravidogram is being developed for the population of a certain area with homogeneous features. The most qualitative observation is provided by personalized charts, the indicators of which are adjusted taking into account ethnicity, age, parity, anthropometric characteristics of the mother (height, weight, body mass index (BMI)), parity, pregnancy complications, morbid background, social factors, the influence of psychoactive substances (smoking, alcohol, narcotic drugs). The influencing factors are also the characteristics of the fetus: gestational age, fetal sex, fetal weight, established after birth or antenatal [8]. The gestational age is determined by ultrasound studies conducted during pregnancy in the first or second trimester. Using ultrasound data of the first trimester, they help to establish the most accurate age [3]. Personalized charts allow for better monitoring of fetal growth, so scientists Jason Gardosi et al. It was noted that the training of medical personnel to work with these schedules and the assessment of fetal growth in regions with high rates of stillbirth reduces the rates of antenatal losses [6]. The authors claim that their proposed GROW graphs, which are based on indicators of the height of the uterine fundus, make it possible to calculate the estimated fetal weight on curves adjusted for characteristics known at the beginning of pregnancy, which makes it possible to detect fetal growth disorders in a timely manner [7].

Ravula et al. It was found that the introduction of personalized schedules increased the diagnosis of OCD from 51.1 to 67.1%, a decrease in the overall stillbirth rate from 4.4 to 3.4 per 1000 births, in addition, a decrease in the incidence of full-term newborns was noted [14]. Clausson et al.in their study, the effectiveness of population and individual schedules was compared, the results of which showed that individual assessment increases the detection of constitutionally small fetuses and reduces unnecessary obstetric interventions, as well as a reduction in stillbirth by almost half, in case of timely diagnosis of fetal growth retardation [3].

The purpose of the study: to study the influence of the characteristics of the mother (age and parity) on the growth of the FH curves during pregnancy, in order to further apply these variables in the construction of individual diagrams in the Kazakh population.

Materials and methods.

Research design: Retrospective, one-time cross-sectional. A set of research materials was conducted in women's consultations and maternity hospitals in Semey and nearby settlements, Zyryanovsk, Astana, Aksu, Almaty, Atyrau from 2016 to 2021. The research was approved by the Local Ethics Committee of the NAO "Semey Medical University" (Protocol No. 2 of 10.25.2018). We studied individual cards of pregnant women and the history of childbirth: individual cards f # 077/y, # 111/y - 3805, birth history f # 096/y,001/y - 3260. The criteria for inclusion in the study were: the presence of ultrasound screening of the first trimester of pregnancy at 10-14 weeks, uncomplicated pregnancy, single pregnancy. Exclusion criteria: multiple pregnancy, pelvic presentation of the fetus, incorrect fetal positions (transverse, oblique), fetal weight up to 2500 grams and over 4000 grams, premature birth, hypertensive conditions, antenatal fetal death, fetal CMF, polyhydramnios, low water, extragenital pathology. The gestation period was calculated at the time of each appearance from the index of the coccygeal-parietal size at the first screening ultrasound according to the Clinical Protocol of the Ministry of Health of the Republic of Kazakhstan "Management of physiological pregnancy" dated September 19, 2013.

Statistical analysis was carried out using the StatTech v. 3.0.9 program (developed by Stattech LLC, Russia). Quantitative indicators were evaluated for compliance with the normal distribution using the Kolmogorov-Smirnov criterion. Since differences from the normal distribution were revealed, quantitative data were described using the median (Me) and the lower and upper quartiles (Q1 – Q3). Categorical data were described with absolute values and percentages.

The comparison of the two groups by quantitative indicator was performed using the Mann-Whitney U-test. Comparison of three or more groups by quantitative indicator was performed using the Kraskel-Wallis criterion. The direction and closeness of the correlation between the two quantitative indicators were assessed using Spearman's rank correlation coefficient. A predictive model characterizing the dependence of a quantitative variable on factors was developed using the linear regression method.

Results

Taking into account the inclusion and exclusion criteria, we selected 3886 cases of full-term pregnancy in head presentation, which ended with the birth of a live fetus weighing from 2500 to 4000 grams. The proportion of first-time patients was 33.12% (n=1287), repeat-giving 66.88% (n=2599). Among pregnant women with repeated births, the largest number were pregnant women with a history of 1 birth – 54.8% (n=1424). There were 2 births in the anamnesis in 31.4% (n=814), 3 births or more in 13.8% (n=361) of patients, respectively. More than 80% (n=3116) of pregnant women lived in the city, in rural areas 19.8% (n=770). By age, the distribution of pregnant women was as follows: 3.4% (n=131) under the age of 20, 28.9% (n=1124) in the group of 20-24 years, the largest group consisted of patients aged 25-29 years - 33.4% (n=1299) of patients. The number of pregnant women aged 30-34 years was 22.1% (n=860), older than 35 years – 12.1% (n=472).

As a result of comparing the values of FH in pregnancy from 20 to 41 weeks, depending on age, significant differences were found (Table 1) at 26, 28, 31, 32, 35 and 37-38 weeks of pregnancy ($p = 0.009$, $p = 0.001$, $p < 0.001$, $p < 0.001$, $p < 0.001$, $p = 0.002$, $p < 0.001$, respectively).

When assessing the influence of the mother's age on FH by the method of correlation analysis, direct connections of weak crowding were established. Linear regression showed that an increase in the age of the mother by 1 year increases FH at 26, 28, 31, 35, 38 and 41 weeks by 0.047 cm; 0.055 cm; 0.049 cm; 0.063 cm; 0.049 cm; 0.057 cm and 0.067 cm, respectively. The resulting model explains 1.9%; 2.4%; 2.0%; 3.0%; 1.9%; 2.0% and 2.2% of the observed variance of FH in these terms of pregnancy.The analysis of the standing height of the uterine fundus was performed depending on the parity of labor (Table 2). According to the data obtained, statistically significant differences were found when comparing the FH of 26 , 27 , 29 - 38, 41 weeks, depending on the parity of childbirth ($p = 0.022$, $p = 0.028$, $p = 0.034$, $p = 0.022$, $p = 0.001$, $p < 0.001$, $p = 0.009$, $p = 0.011$, $p < 0.001$, $p = 0.047$, $p = 0.007$, $p < 0.001$, $p = 0.033$, respectively) (Table 2). The presence in the anamnesis of two births revealed a difference in the average values of FH compared with prim parous women at the terms of 26, 27, 30 and 34 weeks. ($p = 0.022$, $p = 0.028$, $p = 0.022$, $p = 0.011$). High rates of FH were more common in pregnant women who had a history of two births, at 31, 32, 33 weeks of pregnancy, compared with pregnant women who gave birth for the first time or for the second time (Table 2). High rates of FH were more common in pregnant women who had a history of childbirth at 35 and 38 weeks gestation. The more births there are in the anamnesis, the more often there were high rates of FH at 35 and 38 weeks of pregnancy. When analyzing the FH of 20-25 weeks, 28, 39, 40 and 42 weeks, depending on the parity of labor, we were unable to establish statistically significant differences.

A correlation analysis of the relationship between the height of the uterine fundus from age groups and parity groups was performed (Table 3). When assessing the connection of the FH of 31 - 33, 35 weeks and parity, weak tightness of direct connections were established. With an increase in parity by 1, we should expect an increase in WDM at week 31 by 0.208 cm; week 32 by 0.254 cm; week 33 by 0.154 cm and week 35 by 0.189 cm. The resulting model explains 1.4%, 1.6%, 0.8% and 1.1% of the observed variance of WDM 31 - 33 weeks, WDM 35 weeks, respectively.

When assessing the relationship between FH 38 weeks, FH 40 - 42 weeks and parity, there was a weak close direct correlation (Table 3). By the method of linear regression, it was found that with an increase in parity by 1 birth, an increase in FH of 38 weeks should be expected. at 0.189 cm; FH 40 weeks. by 0.188 cm; FH 41 weeks. at 0.576 cm and 42 weeks of FH. by 7,845 cm. The resulting model explains 0.9%, 0.7%, 6.4%, 66.1% observed variance, WDM 38 weeks, WDM 40 - 42 weeks. When studying the relationship between FH and maternal parity using correlation analysis (Table 3), we found that a weakly close direct relationship was established between FH and maternal parity.

Table 1.

Analysis of uterine floor height by gestational week according to age groups.

Term of the week	Age groups					p
	1 (Me)	2 (Me)	3 (Me)	4 (Me)	5 (Me)	
20	21	20	20	20	20	0.260
21	21	21	21	21	21	0.183
22	22	22	22	22	22	0.272
23	23	23	23	23	23	0.563
24	24	24	24	24	24	0.055
25	25	25	25	25	25	0.123
26	26	26	26	26	26	0.009* p_{5-2}= 0.011
27	26	27	27	27	27	0.101
28	27	28	28	28	28	0.001* p_{4-1}=0.044 p_{4-2}=0.014
29	29	29	29	29	30	0.423
30	29	30	30	30	30	0.247
31	30	30	30	31	30	< 0.001* p_{3-2} = 0.012 p_{4-2} = 0.003
32	31	31	31	32	32	< 0.001* p_{4-2} < 0.001 p_{5-2} < 0.001
33	32	32	33	33	32	0.065
34	33	33	34	34	34	0.059
35	33.5	34	34	34	35	< 0.001* p_{3-1} = 0.026 p_{4-1} = 0.014 p_{5-1} < 0.001 p_{5-2} = 0.001
36	35	35	35	35	35	0.356
37	35	36	36	36	36	0.002* p_{3-1} = 0.038 p_{4-1} = 0.047 p_{5-1} = 0.017
38	35	36	36	36	37	< 0.001* p_{4-1} = 0.007 p_{5-1} < 0.001 p_{5-2} = 0.001 p_{5-3} = 0.004
39	36	36	37	37	37	0.270
40	36	37	37	37	37,5	0.055
41	36.5	37	37	37	37,5	0.412
42			35.5	39	0.00	0.162

* *Kraskell-Wallis test, differences are statistically significant (p < 0.05).*
Group 1: under 20 years of age; Group 20-24 years; Group 3: 25-29 years; Group 4: 30-34 years; Group 5: over 35 years

In a pairwise comparison of parity groups and UFH indicators in the subjects, it was found that statistically significant differences were revealed on 26-38, 41 (p=0.022; p=0.028; p=0.034; p=0.022; p=0.001; p<0.001; p=0.009; p=0.011; p< 0.001; p=0.047; p=0.007; p< 0.001; p=0.033, respectively), while on 21-25, 28, 37, 39, 40, 42 the dependence was not statistically significant for weeks. With an increase in parity for 1 birth, an increase in UFH in the terms of 31 - 33, 35 weeks by 0.208 cm; 0.254 cm; 0.154 cm; 0.189 cm, respectively, should be expected. The resulting model explains 1.4%; 1.6%; 0.8%; 1.1% of the observed WDM variance. With an increase in parity by 1 birth in terms of 38, 40.41, 42 weeks, an increase in UFH by 0.189 cm; 0.188 cm; 0.576 cm; 7.845 cm, respectively, and in these terms, the resulting model explains 0.9%; 0.7%; 6.4%; 66.1% the observed variance of the UFH.

The evaluation of the dependence of fetal weight on quantitative factors was performed using the linear regression method (Table 4).

The observed dependence of fetal weight on the parity of childbirth and age groups is described by the linear regression equation:

Fetal mass = 3234.508 + 62.645X1 births + 106.520X2 births + 108.073X3 and more + 84.353X20-24 + 102.519X25-29 + 109.111X30-34 + 89.081X Older than 35 (1)

where Y is the value of the fetal mass, X1 births are Parity groups (0 – Absence of childbirth, 1 – 1 childbirth), X2 births are Parity groups (0 – Absence of childbirth, 1 – 2 births), X3 and more are Parity groups (0 – Absence of childbirth, 1 – 3 and more), X20-24 – Age groups (0 – younger than 20, 1 – 20-24), X25-29 – Age groups (0 – younger than 20, 1 – 25-29), X30-34 – Age groups (0 – younger than 20, 1 – 30-34), X Older than 35 – Age groups (0 – younger 20, 1 – older than 35)

If there is a history of 1 birth, an increase in fetal weight by 62.645 grams should be expected, and after 2 births, an increase in fetal weight by 106.520 grams should be expected compared to prim parous women (1).

Also, in pregnant women with parity of 3 or more births, an increase in fetal weight by 108.073 grams should be expected. In the age group of 20-24 years, an increase in fetal weight by 84.353 grams should be expected compared to the age group under 20 years.

The subjects in the age group of 25-29 years should expect an increase in fetal weight by 102.519 grams, and in the group of women aged 30-34 years - by 109.111 grams compared with pregnant women younger than 20 years. In women over 35, an increase in fetal weight of 89.081 grams should be expected. The resulting regression model is characterized by a correlation coefficient rxy = 0.159, which corresponds to a weak tightness of the connection on the Cheddock scale. The model was statistically significant ($p < 0.001$). The resulting model explains 2.5% of the observed variance of fetal mass.

Table 2.

Analysis of uterine floor height by gestational week according to parity groups.

Term of the week	Parity groups				p
	1 (Me)	2 (Me)	3 (Me)	4 (Me)	
20	20	20	20	20	0.417
21	21	21	21	21	0.537
22	22	22	22	22	0.152
23	23	23	23	23	0.352
24	24	24	24	24	0.532
25	25	25	25	25	0.337
26	26	26	26	26	0.022* $p_{\text{2 birth – no birth}}$ = 0.040
27	26	27	27	27	0.028* $p_{\text{2 birth – no birth}}$ = 0.040
28	27	28	28	28	0.194
29	29	29	29	30	0.034* $p_{\text{3 or more births – no birth}}$ = 0.030 $p_{\text{3 or more births – 1 birth}}$ = 0.046
30	30	30	30	30	0.022* $p_{\text{2 birth – no birth}}$ = 0.012
31	30	30	31	30	0.001* $p_{\text{2 birth – no birth}}$ = 0.001 $p_{\text{2 birth – 1 birth}}$ = 0.011
32	31	31	32	32	< 0.001* $p_{\text{2 birth – no birth}}$ < 0.001 $p_{\text{2 birth – 1 birth}}$ = 0.015
33	32	33	33	33	0.009* $p_{\text{1 birth – no birth}}$ = 0.037 $p_{\text{2 birth – no birth}}$ = 0.037
34	33	33	34	33	0.011* $p_{\text{2 родов – no birth}}$ = 0.006
35	34	34	35	35	< 0.001* $p_{\text{2 birth – no birth}}$ < 0.001 $p_{\text{3 or more births – no birth}}$ = 0.023 $p_{\text{2 birth – 1 birth}}$ = 0.006
36	35	35	35	35	0,047*
37	36	36	36	36	0.007* $p_{\text{3 or more births – no birth}}$ = 0.018
38	36	36	36	37	< 0.001* $p_{\text{1 birth – no birth}}$ = 0.009 $p_{\text{2 birth – no birth}}$ = 0.001 $p_{\text{3 or more births – no birth}}$ = 0.019
39	37	37	37	37	0.534
40	37	37	37	38	0.056
41	36	36	37	39	0.033*
42	35	36	39	0	0.296

** Kraskell-Wallis test, differences are statistically significant ($p < 0.05$).*
Group 1 - no birth; group 1 - 1 birth; group 3 - 2 birth; group 4 - 3 or more births;

Table 3.

Correlation analysis uterine floor height by gestational week as a function of age and parity groups.

Term of the week	Characteristics of the correlation Age and Uterine Floor Height			Characteristics of the correlation Parity and Uterus Floor Height		
	ρ	Tightness	p	ρ	Tightness	p
20	0.049	No relationship	0.159	0.059	No relationship	0.089
21	0.071	No relationship	0.047*	0.045	No relationship	0.211
22	0.062	No relationship	0.139	0.081	No relationship	0.053
23	0.036	No relationship	0.373	0.047	No relationship	0.245
24	0.060	No relationship	0.071	0.041	No relationship	0.210
25	0.060	No relationship	0.073	0.052	No relationship	0.121
26	0.137	Weak relationship	< 0.001*	0.097	No relationship	0.007*
27	0.061	No relationship	0.050*	0.080	No relationship	0.011*
28	0.151	Weak relationship	< 0.001*	0.064	No relationship	0.126
29	0.075	No relationship	0.043*	0.078	No relationship	0.035*
30	0.067	No relationship	0.010*	0.056	No relationship	0.032*
31	0.107	Weak relationship	< 0.001*	0.143	Weak relationship	< 0.001*

Continuation of the Table 3.

Term of the week	Characteristics of the correlation Age and Uterine Floor Height			Characteristics of the correlation Parity and Uterus Floor Height		
	ρ	Tightness	p	ρ	Tightness	p
32	0.147	Weak relationship	< 0.001*	0.191	Weak relationship	< 0.001*
33	0.110	Weak relationship	0.002*	0.042	No relationship	0.223
34	0.079	No relationship	0.007*	0.092	No relationship	0.001*
35	0.128	Weak relationship	< 0.001*	0.147	Weak relationship	< 0.001*
36	0.068	No relationship	0.010*	0.065	No relationship	0.014*
37	0.093	No relationship	< 0.001*	0.093	No relationship	< 0.001*
38	0.109	Weak relationship	< 0.001*	0.124	Weak relationship	< 0.001*
39	0.027	No relationship	0.400	0.056	No relationship	0.083
40	0.104	Weak relationship	0.008*	0.068	No relationship	0.082
41	0.227	Weak relationship	0.006*	0.161	Weak relationship	0.054
42	-0.190	Weak relationship	0.652	-0.079	No relationship	0.853

** Spearman rank correlation coefficient, differences are statistically significant (p < 0.05)*

Table 4.

Analysis of fetal weight as a function of birth parity, age groups.

	B	Std. error	t	p
Intercept	3234.508	29.014	111.481	< 0.001*
Parity groups: 1 births	62.645	13.814	4.535	< 0.001*
Parity groups: 2 births	106.520	17.141	6.214	< 0.001*
Parity groups: 3 or more	108.073	23.039	4.691	< 0.001*
Age groups: 20-24	84.353	30.868	2.733	0.006*
Age groups: 25-29	102.519	31.578	3.247	0.001*
Age groups: 30-34	109.111	32.976	3.309	< 0.001*
Age groups: over 35	89.081	35.432	2.514	0.012*

** differences are statistically significant (p < 0.05)*

Discussion

In this study, we studied the influence of the variables age and maternal parity on the growth of UFH during pregnancy in head diligence, which ended with the birth of a live fetus weighing from 2500 to 4000 grams. A number of other factors have a significant impact on fetal growth, such as ethnicity, fetal characteristics (gestational age, sex, fetal weight) [15], social, genetic, environmental, nutritional and others [4], the influence of which in each population must be considered without fail. According to our results, in the Kazakh population, pregnant women over 30 years of age are more likely to have higher rates of UFH compared to pregnant women under 20 years of age, the greatest difference was found in the terms of 28, 31, 32, 35 and 37, 38 weeks of pregnancy, i.e. in the third trimester of pregnancy.

When studying the average values of UFH depending on the mother's parity groups, we found that in the terms of 26-35 weeks of pregnancy, women who had previously given birth had high rates of UFH and high rates were more common with each birth. In quantitative terms, with an increase in parity for 1 delivery, UFH increases in gestation periods of 31-33. 35 weeks by 0.208 cm; 0.254 cm; 0.154 cm; 0.189 cm, respectively, and at 38, 40.41, 42 weeks - by 0.189 cm; 0.188 cm; 0.576 cm; 7.845 cm, respectively. High rates of UFH at 31-33 weeks were more common in pregnant women who had a history of two births compared to pregnant women who give birth for the first time or for the second time. And at 35 and 38 gestational weeks, high rates of UFH were more common in pregnant women who had a history of childbirth. The more births there are in the anamnesis, the more often there were high rates of FH at 35 and 38 weeks of pregnancy. In a recent study, the authors found that maternal parity affects fetal weight regardless of the gestational week. And with an increase in the gestational week, the size and weight of the fetus was higher in repeat-bearing women compared to prim parous [10].

Our data are consistent with the results of other authors, according to which individual standards should be adjusted taking into account the characteristics of the mother, such as age and parity [9,12].

In one prospective controlled non-randomized study, where serial measurements of FH were performed and individual tables were constructed, they led to an increase in the antenatal detection of fetal growth retardation up to 48% and excess fetal growth for gestational age up to 46% [10,11]. The authors claim that in children with a large size for gestational age, they were much less likely to be referred for further examination and early detection of excessive fetal growth was missed.

There are also conflicting opinions about individual fetal growth tables. Some authors argue that further large-scale studies are needed to study the benefits and harms (including perinatal mortality) from the use of individual fetal growth tables in various conditions and when measuring both FH and ultrasound [2]. For early detection of fetal growth retardation, the estimated fetal weight is more sensitive and specific. But when assessing the weight of the fetus, it is necessary to take into account factors such as the age and parity of the mother, as well as other non-invasive methods for diagnosing the gestational age of the fetus. Since non-compliance with these factors can lead to errors in the estimated weight of the fetus [17].

The practical significance of these results is determined by the fact that the prognostic significance of any graph of

FH curves increases in the third trimester, when fetal growth retardation occurs as a result of obstetric complications of pregnancy [5, 16].

The results of our study show that when creating individual diagrams, it is necessary to take into account the parity and age of the mother as risk factors for the identification of the IMF and include them for further study. Therefore, the study and evaluation of the impact of individual standards or schedules on the early detection of APS requires further study.

Conclusions

Thus, in the Kazakh population, when developing individual growth schedules for FH during pregnancy, it is necessary to take into account variables such as age and maternal parity. In the study, pregnant women over 30 years old and with a history of childbirth had high rates of FH. The frequency of childbirth increases FH with each subsequent pregnancy. These variables have a statistically significant effect on the values of the height of the uterine fundus during pregnancy. The standard schedules offered for a certain country do not allow to fully assess and timely identify pathological abnormalities in a certain population.

Authors' contribution:

Sharipova M.G., Shakhanova A.T. - literature search, writing draft version, descriptive part.

Tanysheva G.A., Kystaubayeva A.S. - scientific supervision, comments to the draft version, approval of the final version.

Sharipova M.G., Shakhanova A.T., Khamidullina Z.G. - formal analysis, conceptualization and conceptualization.

Ryspayeva Zh.A., Sharipova Kh.K. – data typing, correspondence with the journal editorial board.

Funding: No third-party funding was provided.

Conflict of interest: The authors declare that there is no conflict of interest.

Publication details: This material has not been published in other journals and is not under consideration by other publishers.

Literature:

1. *Barros F.C. et al.* Global report on preterm birth and stillbirth (3 of 7): evidence for effectiveness of interventions // BMC pregnancy and childbirth. 2010. Vol. 10 Suppl 1, P.S3.

2. *Carberry A.E. et al.* Customised versus population-based growth charts as a screening tool for detecting small for gestational age infants in low-risk pregnant women // The Cochrane database of systematic reviews. 2014. Vol. 2014, №5. P. CD008549.

3. *Clausson B. et al.* Perinatal outcome in SGA births defined by customised versus population-based birthweight standards // BJOG : an international journal of obstetrics and gynaecology. 2001. Vol. 108, № 8. P. 830–834.

4. *Duhig K., Myers J.* Detecting fetal growth restriction with customised assessment: Is the jury still out? // PLoS medicine. 2022. Vol. 19, № 6. P. e1004028.

5. *Frusca T. et al.* Fetal size and growth velocity in chronic hypertension // Pregnancy hypertension. 2017. Vol. 10. P. 101–106.

6. *Gardosi J. et al.* Association between reduced stillbirth rates in England and regional uptake of accreditation training in customised fetal growth assessment // BMJ Open. 2013. Vol. 3, № 12. P. e003942.

7. *Gardosi J.* Customized charts and their role in identifying pregnancies at risk because of fetal growth restriction // Journal of obstetrics and gynaecology Canada : JOGC. Elsevier Masson SAS, 2014. Vol. 36, № 5. P. 408–415.

8. *Gardosi J., Clausson B., Francis A.* The value of customised centiles in assessing perinatal mortality risk associated with parity and maternal size // BJOG : an international journal of obstetrics and gynaecology. 2009. Vol. 116, № 10. P. 1356–1363.

9. *Gardosi J. et al.* Customized growth charts: rationale, validation and clinical benefits // American journal of obstetrics and gynecology. Elsevier Inc., 2018. Vol. 218, № 2S. P. S609–S618.

10. *Gardosi J., Francis A.* Controlled trial of fundal height measurement plotted on customised antenatal growth charts // British journal of obstetrics and gynaecology. 1999. Vol. 106, № 4. P. 309–317.

11. *Gelbaya T.A., Nardo L.G.* Customised fetal growth chart: a systematic review. // Journal of obstetrics and gynaecology : the journal of the Institute of Obstetrics and Gynaecology. 2005. Vol. 25, № 5. P. 445–450.

12. *Kiserud T. et al.* The World Health Organization fetal growth charts: concept, findings, interpretation, and application // American journal of obstetrics and gynecology. 2018. Vol. 218, № 2S. P. S619–S629.

13. *Millogo T. et al.* Factors associated with fresh stillbirths: A hospital-based, matched, case-control study in Burkina Faso // International Journal of Gynecology & Obstetrics. 2016. Vol. 135, № S1. P. S98–S102.

14. *Ravula P.C. et al.* Impact of introduction of the growth assessment protocol in a South Indian tertiary hospital on SGA detection, stillbirth rate and neonatal outcome // Journal of perinatal medicine. 2022. Vol. 50, № 6. P. 729–736.

15. *Tarca A.L. et al.* A new customized fetal growth standard for African American women: the PRB/NICHD Detroit study // American Journal of Obstetrics and Gynecology. 2018. Vol. 218, № 2. P. S679-S691.e4.

16. *Williams M. et al.* Fetal growth surveillance – Current guidelines, practices and challenges // Ultrasound. 2018. Vol. 26, № 2. P. 69–79.

17. *Wallace J.M., Agard J.P., Horgan G.W.* A new customised placental weight standard redefines the relationship between maternal obesity and extremes of placental size and is more closely associated with pregnancy complications than an existing population standard // Journal of developmental origins of health and disease. 2020. Vol. 11, № 4. P. 350–359.

*** Corresponding author:**

Sharipova Meruert – Assistant in the Department of Obstetrics and Gynaecology A.A. Kozbagarov, MD, NJSC «Semey medical university», city of Semey, Republic of Kazakhstan.

Postal address: Republic of Kazakhstan, 071400, Semey, Abaya st. 103.

E-mail: meruert_sharipov@mail.ru

Phone: 8 701 748 97 91