

Association between education level of women with advanced maternal age and Apgar score in newborns

Associação entre escolaridade de mulheres com idade materna avançada e índice Apgar em neonatos

Asociación del nivel educativo de mujeres con edad materna avanzada y puntuación Apgar en neonatos

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RESUMO

Objetivo: Investigar a correlação entre nível de escolaridade materna e Apgar neonatal de parturientes com 40 anos ou mais em um hospital universitário de Brasília. **Métodos:** Trata-se de um estudo transversal retrospectivo, através da análise de prontuários físicos e eletrônicos de mulheres ≥ 40 anos com parto vaginal em 2021. Foram coletados dados sociodemográficos, clínicos e neonatais. A associação entre o índice Apgar e a escolaridade foi avaliada pelo teste de Spearman, considerando significância de 5% ($p < 0,05$). Resultados: Das 1384 parturientes, 54 (3,9%) tinham idade ≥ 40 anos (média $41,98 \pm 1,95$). A maioria possuía ensino médio completo (47,58%) e era múltipara (85,19%). O peso médio dos neonatos foi de 3.190 g, e 85,19% apresentaram Apgar entre 7 e 9 no primeiro minuto. Identificou-se associação estatisticamente significativa entre maior escolaridade materna e melhores escores de Apgar ($p = 0,045$). **Conclusões:** A idade materna avançada influencia desfechos maternos e neonatais, a escolaridade materna demonstrou associação significativa com o índice de Apgar no primeiro minuto. Políticas de educação em saúde e fortalecimento do pré natal devem ser priorizadas para gestantes em idade avançada.

Descritores: gravidez; trabalho de parto; educação; Índice de Apgar.

ABSTRACT

Objective: To investigate the correlation between maternal education level and neonatal Apgar scores of parturients aged 40 years or older in a university hospital in Brasília. **Methods:** This was a retrospective cross-sectional study that analyzed physical and electronic medical records of women aged ≥ 40 years who delivered vaginally in 2021. Sociodemographic, clinical, and neonatal data were collected. The association between the Apgar score and education level was assessed using Spearman's test, considering a significance level of 5% ($p < 0.05$). Results: Of the 1,384 parturients, 54 (3.9%) were ≥ 40 years old (mean 41.98 ± 1.95). The majority had completed high school (47.58%) and were multiparous (85.19%). The mean weight of the newborns was 3,190 g, and 85.19% had an Apgar score between 7 and 9 at the first minute. A statistically significant association was identified between higher maternal education and better Apgar scores ($p = 0.045$). **Conclusion:** Advanced maternal age influences maternal and neonatal outcomes, and maternal education demonstrated a significant association with the first-minute Apgar score. Health education policies and strengthening prenatal care should be prioritized for older pregnant women

Descriptors: pregnancy; labour; education; Apgar Score.

RESUMEN

Objetivo: Investigar la correlación entre el nivel de educación materna y la puntuación de Apgar neonatales de parturientas de 40 años o más en un hospital universitario de Brasília. **Métodos:** Estudio transversal retrospectivo que analizó los registros clínicos físicos y electrónicos de mujeres ≥ 40 años que tuvieron parto vaginal en 2021. Se recopilaron datos sociodemográficos, clínicos y neonatales. La asociación entre la puntuación de Apgar y el nivel educativo se evaluó mediante la prueba de Spearman, con un nivel de significancia del 5% ($p < 0,05$). **Resultados:** De las 1384 parturientas, 54 (3,9%) tenían ≥ 40 años (media: $41,98 \pm 1,95$). La mayoría había completado la educación secundaria (47,58%) y eran múltiparas (85,19%). El peso medio de los recién nacidos fue de 3190 g, y el 85,19% presentó una puntuación de Apgar entre 7 y 9 en el primer minuto. Se identificó una asociación estadísticamente significativa entre una mayor educación materna y mejores puntuaciones de Apgar ($p = 0,045$). **Conclusiones:** La edad materna avanzada influye en los resultados maternos y neonatales, y la educación materna demostró una asociación significativa con la puntuación de Apgar en el primer minuto. Se deben priorizar las políticas de educación sanitaria y el fortalecimiento de la atención prenatal para las embarazadas mayores.

Descriptores: embarazo; parto; educación; puntuación de Apgar.

INTRODUCTION

In recent decades, there has been an observed increase in maternal age among parturients. The main reasons for this increase are believed to be social and economic factors associated with women and motherhood, which have been changing in recent years.¹⁻² Increased life expectancy is also a possible factor influencing the increase in pregnant women with advanced maternal age.³

Advanced maternal age can impact maternal and neonatal outcomes due to several factors, such as the aging of the female reproductive system and comorbidities inherent to aging.² The main adverse outcomes observed in the literature in these cases are pre-eclampsia, gestational diabetes mellitus, preterm birth, fetal growth restriction, cesarean delivery, stillbirth, low birthweight, placenta previa, instrument delivery, maternal ICU admission, and postpartum hemorrhage, among others.¹⁻³

Women who become pregnant at or above 35 years of age are considered to be of advanced maternal age. However, articles identify that pregnant women aged 40 or older have a higher rate of adverse outcomes during pregnancy, labor, and the postpartum period.¹⁻³ Evidence indicates that pregnant women over 40 years of age tend to have less than 12 years of education when compared to women between 35 and 40 years of age.²

Regarding neonatal outcomes, the APGAR score is a tool that provides a convenient and rapid method of assessing a newborn's condition immediately after birth, indicating whether neonatal interventions are needed at that time. The scale assesses five categories: color, heart rate, reflexes, muscle tone, and respiration, which are scored from zero to two. Therefore, the final score can range from zero to ten, with newborns with scores of 0-3 considered low, 4-6 moderately abnormal, and 7-10 as reassuring.⁴

Maternal education is another factor that must be taken into account when considering neonatal outcomes. Factors such as hypertension, diabetes mellitus, preeclampsia/eclampsia, and smoking are known to be risk factors for low APGAR scores, and these factors are more prevalent in women with low education levels due to low health education and low adherence to prenatal care.⁵⁻⁶

Taking into account the information above, it is observed that there is a lack of studies that evaluate the impact of the level of education, specifically of parturients with advanced maternal age, on the newborn's APGAR score.

OBJECTIVE

To investigate the correlation between maternal education level and Apgar scores at birth among newborns of parturients aged 40 years or older, in a university hospital in Brasília.

METHODS

A retrospective cross-sectional study was conducted using secondary data analysis. Data were retrieved from medical records of women aged 40 or older who underwent vaginal delivery at a university hospital in Brasília in 2021.

Data extraction was conducted from September 2023 to August 2024, using full names and registration numbers to retrieve data on the women in labor. Data were collected using a form with the variables and later entered into a digital spreadsheet.

This study was approved by the Ethics Committee CAAE 80704617.5.0000.8093. The inclusion criteria were patients who had a vaginal delivery with a single live newborn, during the year 2021. Medical records with missing data or filling errors were considered exclusion criteria.

The variables collected were divided into sociodemographic and clinical variables, with sociodemographic data including age, ethnicity, marital status, and educational level. Clinical variables included presence of a companion, parity, gestational age, pharmacological induction, perineal laceration, and intrapartum physical therapy. The following neonatal clinical variables were also collected: newborn weight, length, head circumference, and APGAR score.

Statistical analyses were performed using IBM SPSS Statistics (version 25), with Spearman's correlation assessing the association between maternal education level and APGAR scores at birth. A significance level of 5% ($p < 0.05$) was adopted. Furthermore, analysis of secondary variables was carried out using descriptive statistics, including absolute and percentage frequencies, presented in tables.

RESULTS

In 2021, the number of vaginal deliveries at a public hospital in the Federal District (DF) was 1,384. Data from 54 (3.90%) eligible women were aged 40 to 49, constituting advanced maternal age.

The mean maternal age was 41.98 years (SD: 1.95), ranging from 40 to 47 years. Sociodemographic data were represented in Table I. Among these women, 79.63% identified as brown-skinned, 9.26% were missing data, 7.41% were white-skinned, 3.70% were black-skinned. When related to marital status, 33.33% of the parturients were married, 29.63% were single, 12.96% had other type of marital status, 11.11% were in a stable union, 11.11% had missing data and 1.85% were divorced.

The most prevalent level of education was 27.78% women who had completed high school, 14.81% of parturients didn't complete middle school, 9.26% completed middle school, 5.56% had completed higher education, 3.70% were illiterate, 3.70% had incomplete high school education and 1.85% had incomplete higher education, 33.33% of the data were ignored.

Table I: Sociodemographic data of parturients who had a vaginal birth in 2021 and were over 40 years old.

	N	%
Ethnicity		
Brown-skinned	43	79.63%
Black-skinned	2	3.70%
White-skinned	4	7.41%
Missing data	5	9.26%
Marital Status		
Single	16	29.63%
Married	18	33.33%
Stable union	6	11.11%
Divorced	1	1.85%
Other	7	12.96%
Missing data	6	11.11%
Educational level		
Illiterate	2	3.70%
Incomplete Middle School	8	14.81%
Complete Middle School	5	9.26%
Incomplete High School	2	3.70%

Complete High School	15	27.78%
Incomplete Higher Education	1	1.85%
Complete Higher Education	3	5.56%
Ignored	18	33.33%

Abbreviations: N - Absolute number; % - Percentage.

As seen on Table II, 85.19% of the parturients were multiparous and the mean gestational age was 38 weeks and 5 days (SD: 11.17). 14.81% were primiparous. Most of parturientes (62.96%) had labor induction (misoprostol and/or oxytocin) and 37.04% had no induction. Despite most participants being multiparous, 62.9% required labor induction, with an average labor duration of 971.31 minutes (SD: 959.11).

Most women (83.33%) had the presence of a companion during birth and 14.81% had no companion. 44.44% experienced no perineal laceration after birth. There were no third or fourth lacerations with this sample. 25.93% had first degree laceration and 25.93% had second degree laceration. Most parturients didn't receive Physical Therapy during their childbirth (77.78%) and 14.81% had the presence of physical therapists during labour.

Table II: Obstetric data on parturients who had a vaginal birth in 2021 and were over 40 years old.

	N	%
Parity		
Primiparous	8	14.81%
Multiparous	46	85.19%
Induction		
Yes	34	62.96%
No	20	37.04%
Presence of a companion		
Yes	45	83.33%
No	8	14.81%
Missing data	1	1.85%

Laceration		
None	24	44.44%
Degree 1	14	25.93%
Degree 2	15	27.78%
Missing data	1	1.85%
Physical Therapy during childbirth		
Yes	8	14.81%
No	42	77.78%
Missing data	4	7.41%

Abbreviations: N - Absolute number; % - Percentage.

Regarding newborns, the mean birth weight was 3.190 (SD: 0.44), with 57.41% having a normal birth weight (3.000 to 3.999 g), 37.04% having a low birth weight (1.000 to 1.499 g), and 5.56% weighing over 4.000 g.

The mean length of the newborns was 48.05 cm (SD: 3.31) and the head circumference had a mean of 34.13 (SD: 2.48).

As reported in Table III, APGAR was reassuring (7 to 10) in 85.19% of cases in the first minute. Only 12.96% of patients had APGAR between 4 and 6.

Table III: Characteristics of newborns born vaginally in 2021.

	N	%
Peso do RN (g)		
Baixo peso ao nascer (1.000 g à 1.499 g)	20	37.04%
Normal (3.000 g à 3.999g)	31	57.41%
Macrossomia (>=4.000 g)	3	5.56%
APGAR do RN		

1 a 3	0	0
4 a 6	7	12.96%
7 a 10	46	85.19%
S/I	1	1.85%

Abbreviations: N - Absolute number; % - Percentage.

Spearman's correlation analysis revealed a statistically significant association between maternal education level and Apgar scores at birth ($p = 0.045$), suggesting that parturients with higher educational levels tend to have newborns with better Apgar scores at birth.

DISCUSSION

This study aimed to describe the profile of women who had vaginal birth in a public hospital in 2021 in Brasília - Brazil with advanced maternal age and to investigate the association between APGAR and maternal education.

Published in 2021 an article made a similar study with women above 40 years old who gave birth in the United States in 2017, and the data from parturients with 40 years or older were similar to this study (3.20%).⁷ This sample had similar mean ages between groups compared with the mean maternal age found in this study.⁷ A 2019 study² compared groups of different ages and described that women over 40 years old were more likely to have more than 12 years of education, that is, completed high school. Researchers studied women who gave birth in Spain from 2011 to 2015 and assessed the sociodemographic characteristics of women over 40⁸ The study found similar percentages to this study regarding the education of the parturient.⁸

Regarding obstetric clinical variables, some studies corroborated the data presented. Regarding parity, the majority (85.19%) were multiparous, which corroborates the findings of another study, which also evaluated women of advanced maternal age, in which 77.3% were also considered multiparous. This data is expected considering that the sample consisted of women over 40 years of age.⁷

Concerning the variable induction of labor, a study was found that also analyzed adverse obstetric outcomes in women with advanced maternal age, however, although the majority of its participants underwent induction as in the present study, the percentage is very different, in which they found that 34.3% of the participants had induction and in the present study it was 62.96%.³

It was observed that most of the participants in this study had the presence of a companion at the time of delivery (83.33%), which corroborates the data found in a study in which 85.5% of its participants also had a companion present.⁹ However, it should be taken into account that this study did not specifically analyze data from women of advanced maternal age.⁹ It is also worth highlighting that it is in

accordance with Law No. 11,108 of 2005, which guarantees parturients the presence of a companion at this moment.¹⁰

Regarding perineal laceration, it was found that the majority of participants did not have any degree of laceration (44.44%), and that none of them had third and fourth degree lacerations (0.0%), which reinforces what was found in another study in which women over 40 years old (0.0%) did not have third and fourth degree lacerations.¹

In this study, the majority of participants did not receive intrapartum physical therapy support (77.78%), a fact that should be analyzed, taking into account the various benefits that intrapartum physical therapy can bring to these women.¹¹

The newborn weight found in the research was similar to those found in similar studies with 40+ years old women, that is, weight above 2,500g⁷, average of 3,580g and macrosomia in 7%¹. Studies also show that these parturients of advanced maternal age have a prevalence of data related to APGAR above 7, reassuring APGAR.^{1,3,7}

In Brazil, a law project was created to increase and make it mandatory the presence of physical therapists providing intrapartum assistance within maternity hospitals¹², since the non-pharmacological resources of this profession help with fatigue and anxiety during labor.¹³

This study also highlights the importance of the educational level of pregnant women with advanced maternal age in neonatal outcomes, using APGAR scores. A study from 2019⁵ stated in their study that there is an association between a reduced risk of low APGAR scores and increased maternal education. It should also be taken into account that these women's level of education may be associated with the lack of health education policies and projects aimed at guiding and educating about the importance of prenatal care, family planning, and the impact of maternal age on obstetric and neonatal outcomes.

The limitation of the study is related to the bias related to the collection of secondary data. Further high-quality studies are recommended to explore other maternal and neonatal factors.

CONCLUSION

Educational level of advanced maternal age can influence maternal and neonatal outcomes during labor. The maternal education level is significantly associated with a newborn's Apgar score in the first minute of life. This study highlights the significant influence of maternal education level on neonatal outcomes. Health professionals and educators should prioritize health education programs, policies, and initiatives that support prenatal care and family planning, particularly for women of advanced maternal age.

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