

Fuzzy Analytical Hierarchy Process For Social Influencing Factor In C-Section Delivery In Women

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ARTICLE INFO ABSTRACT

The percentage of women who have had a C-section worldwide has risen from roughly 7% in 1990 to 21% in 2023. Although a C-section is a life-saving procedure used to preserve the life of the woman, these days, social as well as medical issues are the reasons behind C-section deliveries. Numerous societal factors, including lifestyle, economic status, and demography, have an impact on the delivery of C-sections. The fuzzy logic theory was utilized in the development of the analytical hierarchy process approach. When managing several decision-making problems with both quantitative and qualitative criteria, the analytical hierarchy process is useful. The analysis of societal factors influencing the delivery of C-sections forms the basis of this work. Through this literature review, we take into account a variety of societal issues that will affect the delivery of C-sections and serve as input. In order to reduce C-Section delivery, we use the Fuzzy Analytical Hierarchy Process model to determine the influencing element. This approach is suited for achieving more satisfied outcomes.

KEYWORDS: Fuzzy Analytical Hierarchy Process, Cesarean Section, Social Factors, Fuzzy logic.

1. INTRODUCTION

Also known as a cesarean section, or C-section. It is a medical operation in which the uterus and abdomen are cut to deliver the baby. The skin incision might be horizontal (extending across the pubic hairline) or vertical (extending from belly button to pubic hairline). Over half of Indian states have high C-section delivery rates, a trend that has been observed globally. Over the past few decades, the number of C-sections performed worldwide has significantly climbed. With 30.3%, the US leads followed by Australia (30%), Germany (28%), Canada (26%), and the UK (22%). India is hardly an exception, with a 10% increase in C-section rates to 17% in 2015–2016. Although C-section deliveries for medical reasons are inevitable, many are performed because of social causes including.

Unregulated health facilities, primarily private ones, and the growing tendency of women electing C-section deliveries are two major contributors to the rising rate of C-section deliveries. To comprehend the increase in the frequency of C-sections, it is necessary to examine several non-clinical factors. A woman's family history and means of subsistence are important considerations when making decisions about childbirth. Lifestyle has a significant role; the rate of obesity among women has increased as a result of changes in lifestyle (such as eating habits and lack of exercise). Here, we take into account five variables, including the mother's age, weight, lifestyle, and economic background. Mothers play a crucial role when studying the rate of C-sections, hence examining the variables associated.

Decision-making based on multiple factors is a common occurrence in all human endeavors. It involves assigning a factor a ranking based on how the other elements compare. Because of the ambiguity and uncertainty involved, decision makers view this process as being extremely complicated. Multicriteria decision making (MCDM) can be applied in a variety of ways to assess data and produce certain outcomes. The fuzzy logic-based model, which is also viewed as an artificial intelligence process, paves the way for the mathematical expression of constant hazy notions and is thought to be one of the suitable approaches for

solving judgment problems. Numerous researchers have examined the C-section delivery factor. They arrived to different conclusions.

This study used the Fuzzy Analytic Hierarchy Process Method to tackle the problem in a unique way. The rising rate of C-section delivery is caused by a variety of variables. Here, we take into account five variables, including the mother's age, weight, lifestyle, antenatal care visit, and economic background. All expectant mothers and their families will find this research useful in providing guidance during the pregnancy. Given the observed rise in cesarean deliveries (CDs), the topic of vaginal birth after cesarean section (VBAC) requires even more urgent attention (1). However, over the years 1989–1996 this growth was momentarily reversed as several researches attempted to demonstrate the benefits of trial of labor after cesarean (TOLAC) (2-4). However, a rise in VBACs brought attention to the problem of scar ruptures, frightening women and pushing them once more to choose cesarean sections (5).

Contrary to popular assumption, however, the increased prevalence of CSs in modern times has resulted in more dangers for both the mother and the child (25% of cases) as opposed to advantages (10–16%) (6). Therefore, it is crucial to learn about all the elements supporting VBAC in order to accurately guide patients and increase the number of vaginal deliveries for women who match the requirements (6). Guidelines from international sources (7) provide support for that statement. They state that their healthcare providers about the specific advantages and disadvantages of both VBACs and elective repeat cesarean sections (ERCS) should inform women who are currently in the middle of a low-risk pregnancy and have had previous cesarean sections.

Women typically base their decision to undergo a VBAC on their desire to begin the processes of bonding and healing as well as their ability to recuperate quickly (8–11), enjoy a natural birth (8–13), and (9, 10). However, women who favor ERCS appear to weigh things like the simplicity of a scheduled birth (11) and the avoidance of pain and potential vaginal injury (14) when making their decision. In 2017, Bonzon et al. (6) created a multivariable logistic regression model in an attempt to identify the variables that often influence the decision to choose VBAC. Researchers discovered that a woman's desire for a vaginal birth and advice from her healthcare provider are the two most significant factors influencing her decision to have a vaginal birth. Women who had contact with midwives during their pregnancy were nearly twice as likely to prefer vaginal births as those who did not.

Factors were divided into groups of two by Signore et al. (2012) (15) based on their relationship to either increased or of VBAC success. Recurring indications for prior CS, larger cervical dilatation at admission, rupture of membranes, and prior VD and/or VBAC were among the factors linked to higher success rates. Contrarily, there is a correlation between lower VBAC success rates and the following factors: post-term labor, labor induction or augmentation, fetal macrosomia, obesity, maternal disease (such as hypertension, diabetes), increased maternal age, single marital status, less than twelve years of education, and any of the aforementioned factors. Fineberg and Tilton (2012) (16) found that, despite what many may want to believe, ERCSs carry more prevalent dangers than VBACs. Water immersion for VBAC has not yet gotten enough attention, despite the fact that Due to the modest number of records indicating that VBACs have no negative impact on the health of either the mother or the fetus, they are regarded as a very promising mode of delivery. According to McKenna et al. (2014) (17), preventing situations that could have resulted in CS and mitigating negative experiences with childbirth in the past were the two primary factors influencing the decision to use a particular mode of delivery.

In their discussion of the medicolegal implications of VBAC, Bonanno et al. (2011) (18) suggested that hospitals are now reluctant to perform VBACs due to concerns about potential difficulties (19) and potential legal repercussions. A statement from the NIH Consensus Conference addressing the issue stated that the medical and legal functions as a roadblock to TOLAC availability. Even though the variables affecting the success rates of VBACs have been researched (15, 20,), there is still a need to look into VBAC-related issues further so that obstetricians can offer evidence-based counseling, boost women's confidence in the particular mode of delivery, and help the mother make her ultimate decision (10). Over the years, numerous VBAC prediction models have been created, but none have demonstrated particularly good performance.

Thus, recent research emphasizes the necessity of investigating novel techniques and modeling methodologies in addition to standard statistical methods for evaluating VBAC and CS success rates. Popular multivariable logistic regression techniques are said to have drawbacks, as they are unable to investigate various interactions among independent components and are not as successful in determining the conditions that are predominant in sub-groups. Moreover, they pay little attention to intuition, even though it is widely acknowledged to play a role in decision-making (. As a result, a number of academics have recently emphasized the necessity of looking into novel techniques including fuzzy logic, neural networks, and machine learning techniques.

2. ELEMENTS AFFECTING THE C- SECTION

Controlling the rise in the C-section rate requires factor analysis. The expert's judgment was the source of the qualitative descriptors. Although there are many factors, only a small number were deemed significant enough to be examined using the FAHP. Our model's input values are:

- Mother Age
- Mother Weight

- Antenatal Care Visit
- Mother Economic Background
- Mother Lifestyle

2.1 Mother's Age

An important factor in C-section birth is the mother's age. Increased pre-pregnant morbidity and related risk factors have been linked to advanced mother age at childbirth and may increase the likelihood of a C-section. The rate of C-sections is rising in tandem with the number of pregnancies among older mothers. Compared to younger moms, older mothers—generally described as those over 35—may need to take different health precautions. Elderly moms may have a higher prevalence of chronic health conditions like diabetes, hypertension, or other conditions that can make it more difficult for them to give birth vaginally.

2.2 Mother's Weight

Pregnant women who were overweight or obese were more likely to experience anxiety or depressed symptoms, which may contribute to their increased risk of caesarean delivery. Maternal obesity has been biologically linked to a number of pregnancy complications and unfavorable delivery outcomes, including hypertensive disease of pregnancy and macrosomia, which may significantly raise the risk of a Cesarean section. Pregnant women who are overweight or obese are more likely to experience surgical complications, such as C-sections. Infections, excessive bleeding, blood clots, wound complications, and problems associated with anesthesia are a few examples of these consequences.

2.3 ANC Visit: (ANTENATAL CARE VISIT)

Pregnancy complications can be identified early and treated with the help of antenatal consultations. To promote the health of expectant mothers and their newborns, timely and high-quality prenatal care must be made available to them. Late antenatal care initiation may be the cause of complications such preeclampsia anemia, adolescent underweight, and single women. According to studies, early ANC attendance is crucial for the early diagnosis and treatment of maternal health issues throughout pregnancy and for preparing the baby for appropriate care both during and after delivery. Healthcare professionals can keep an eye on the expectant patient's general health during prenatal appointments, including blood pressure, weight growth, and any indications of gestational diabetes or preeclampsia. The decision to conduct a C-section as well as the timing and mode of delivery may be impacted by these circumstances.

2.4 Mother Economic Background

Socioeconomic status of women is one of the key factors influencing caesarian delivery. The decision to deliver a baby via C-section is influenced by the mother's low socioeconomic position, which also has an impact on the usage of prenatal care during pregnancy. Women from poorer socioeconomic backgrounds were more likely to give birth via C section. Women from lower socioeconomic backgrounds are more likely to experience stress from things like substandard housing, unemployment, restricted food access, and interpersonal issues like abuse and single parenthood.

Greater socioeconomic status is frequently associated with improved access to healthcare, including prenatal care, for women. This may decrease the need for emergency cesarean sections by improving the monitoring of the pregnancy and any potential issues.

2.5 Mother Life Style

The baby's health during pregnancy may be impacted by the mother's lifestyle. The fetus's growth and well-being are entirely dependent on the health of the mother. Women's health may be impacted by unhealthy lifestyle choices such poor food intake, inactivity, and drug and alcohol use. Unhealthy lifestyle choices can cause problems for both the mother and the fetus if they persist. It is true that a mother's lifestyle choices can have an impact on her unborn child's health during pregnancy, regardless of the delivery method—vaginal birth or cesarean section. The baby's growth in utero can be impacted by a variety of lifestyle factors, including overall health, stress levels, exercise, nutrition, and substance usage (such as smoking or drinking alcohol).The mother's lifestyle decisions prior to birth can still have an impact on the health of the unborn child even in cases where a cesarean section (C-section) is performed. Although the baby's lifestyle choices aren't always directly impacted by the birth method, other factors like the mother's general health, nutritional condition, and stress levels can affect the baby's development in utero regardless of the delivery method.

3. ALTERNATIVES

- A1- Provide better health care in rural areas/where ever it is required
- A2- Initiate to provide financial support for the pregnant ladies during pregnancy period.
- A3- Restructure the health education programs relating to pregnancy.

3.1 PROVIDE BETTER HEALTH CARE IN RURAL AREAS/WHERE EVER IT IS REQUIRED:

Providing improved healthcare is crucial. It is quite difficult for women to travel to the hospital for a prenatal checkup and birth because hospitals are often located in remote places. Inadequate medical facilities cause

low birth weight, morbidity in mothers and babies, etc. Prior to becoming pregnant, a woman's health and wellbeing are crucial to ensuring both the woman and the fetus have a safe pregnancy. Because it enables the medical professional to recognize, address, and stabilize chronic illnesses, access to treatment is essential throughout pregnancy. Making plans for a healthy pregnancy is beneficial.

3.2 INITIATIVE TO PROVIDE FINANCIAL SUPPORT FOR THE PREGNANT LADIES DURING PREGNANCY PERIOD:

One important factor in a woman's pregnancy is her economic background. Government initiatives include the Pradhan Mantri Matru Vandhana Yojna as shown Fig 3.1



Fig 3.1

The primary cause of a poor diet and infrequent prenatal visits is the family's financial situation. Better economic standing families give their ladies access to wholesome food, a better lifestyle, and frequent ANC visits. In order to better care for women, the government must offer low-income families the best possible financial help. It is imperative that the government verify if they are reaping the rewards of these programs.

3.3 RESTRUCTURE THE HEALTH EDUCATION PROGRAMMES RELATING TO PREGNANCY:

Restructuring pregnancy-related health education programs and media is necessary to increase awareness among women who are fertile and to reduce pregnancy-related complications while also improving the quality of life for the fetus. Programs should be created so that both men and women can learn about the importance of a healthy diet, the necessity of regular exercise and rest, the informational nature of ANC visits, the appropriate spacing between pregnancies, etc. The benefits of consuming veggies and other meals high in fiber are often unknown to women. It appears that the health program needs to be redesigned in order to educate women about healthy habits, the significance of ANC visits for women's wellbeing, and the appropriate age to become pregnant. Fig 3.2 shows the Pregnancy Plate.



Fig 3.2

4 METHODOLOGY

Bellman and Zadeh (1970) and Zadeh (1965) established the fuzzy set theory, which articulated the decision-making process in a fuzzy environment. In many scientific, economic, and social domains, fuzzy sets and logical systems are effective mathematical tools. MCDM is a potent operational model that is used to resolve decision making problems on the basis of different decision criteria. FAHP was applied in several areas, including transportation, facility location (Sona.P,2018), logistics, urban planning, public politics, marketing, finance, education, and economics. (Shweta Panjwani, Laxmi Ahuja, and S Naresh Kumar, 2019). Decision-makers have widely employed this strategy in a variety of application domains to address their issues.

Step 1: Comparing the factorsIn fuzzy set theory, the relative strength of every pair of items in the same hierarchy was described using the triangular fuzzy numbers (1, 3, 5, 7, 9). The triangular fuzzy numbers associated with linguistic words are provided in Table 3.1

Table 3.1 Membership Function of Fuzzy Number

Linguistic Variables	Triangular Fuzzy Number
Absolutely Important	(9,9,9)
Very Strongly Important	(6,7,8)
Strongly Important	(4,5,6)
Fairly Important	(2,3,4)
Equally Important	(1,1,1)

Step 2: Construction of Fuzzy comparison matrix

The comparison matrix is represented as \tilde{M} , where \tilde{m}_{ij} represents the preference (relative importance) of i^{th} criterion over j^{th} criteria, by the use of fuzzy triangular numbers.

Table 3.2 Pair Wise Comparisons between Criteria

CONSTRUCTION OF FUZZY COMPARISON TABLE					
	F1	F2	F3	F4	F5
F1	(1,1,1)	(1,1,1)	(1/4,1/3,1/2)	(1/6,1/5,1/4)	(1/9,1/9,1/9)
F2	(1,1,1)	(1,1,1)	(1/6,1/5,1/4)	(1/4,1/3,1/2)	(1/8,1/7,1/6)
F3	(2,3,4)	(4,5,6)	(1,1,1)	(1/8,1/7,1/6)	(1/6,1/5,1/4)
F4	(4,5,6)	(2,3,4)	(6,7,8)	(1,1,1)	(1,1,1)
F5	(9,9,9)	(6,7,8)	(4,5,6)	(1,1,1)	(1,1,1)

Step 3: Geometric mean of fuzzy comparison values of each criterion

The fuzzy comparison values of each factor is calculated using geometric mean as follows, where \tilde{g}_i represents Triangular Number.

$$\tilde{G}_i = (\prod_{j=1}^n \tilde{m}_{ij})^{1/n}, i=1,2,\dots,n \dots\dots\dots (1)$$

The geometric mean each factor is calculated by equation (1). In the above table \tilde{G}_1 geometric mean of fuzzy comparison values of mother age is calculated as follows

$$\begin{aligned} \tilde{G}_1 &= (\prod_{j=1}^5 \tilde{m}_{1j})^{1/5} \\ &= (1 * 1 * 1/4 * 1/6 * 1/9)^{1/5} (1 * 1 * 1/3 * 1/5 * 1/9)^{1/5} (1 * 1 * 1/2 * 1/4 * 1/9)^{1/5} \\ &= (0.3413, 0.3759, 0.4251) \end{aligned}$$

Table 3.3 Geometric Mean Values for Fuzzy Comparison

Gi			
F1	0.3413	0.3749	0.4251
F2	0.3494	0.3942	0.4611
F3	0.6988	0.8441	1
F4	2.1689	2.5365	2.8619
F5	2.9302	3.1598	3.3659
Total	6.4886	7.3096	8.1140
Reverse	0.1541	0.1368	0.1232
Increase	0.1232	0.1368	0.1541

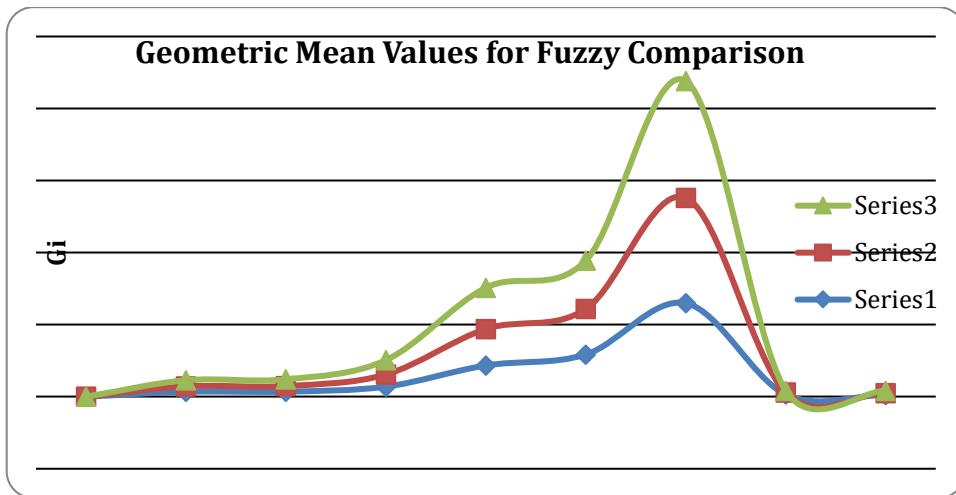


Fig:3.3

Multiply each \tilde{G}_i with this reverse vector to find the fuzzy weight of criterion \tilde{w}_i .

Weight of each criterion = $\tilde{G}_i \oplus (\tilde{G}_1 \oplus \tilde{G}_2 \oplus \dots \oplus \tilde{G}_n)^{-1}$

(ie) $\tilde{w}_i = (lw_i, Mw_i, Nw_i) \dots \dots \dots (2)$

Now consider the fuzzy weight of CI criterion \tilde{w}_1 is given by equation (2)

$\tilde{w}_1 = [0.3413 * 0.123, 0.3749 * 0.1368, 0.4251 * 0.1541]$
 $= [0.0421, 0.0513, 0.0655]$

$NM_1 = \frac{0.0421 + 0.0513 + 0.0655}{3}$
 $= 0.0530$

In the Table1 $N_1 = \frac{NM_1}{\sum_{i=1}^n NM_i} = \frac{0.0530}{1.0167}$
 $= 0.0521$

Table 3.4 Fuzzy Weight W_i , Non Fuzzy Weight M_i , Normalised Weight N_i

Fuzzy Weight (WI)	Non Fuzzy Weight (MI)			Normalized Weight (NI)	
	WI	MI	MI	MI	NI
F1	0.0421	0.0513	0.0655	0.053	0.0521
F2	0.0431	0.0539	0.0711	0.056	0.0551
F3	0.0861	0.1155	0.1541	0.1186	0.1166
F4	0.2673	0.347	0.4411	0.3518	0.346
F5	0.3611	0.4323	0.5187	0.4374	0.4302
TOTAL				1.0167	

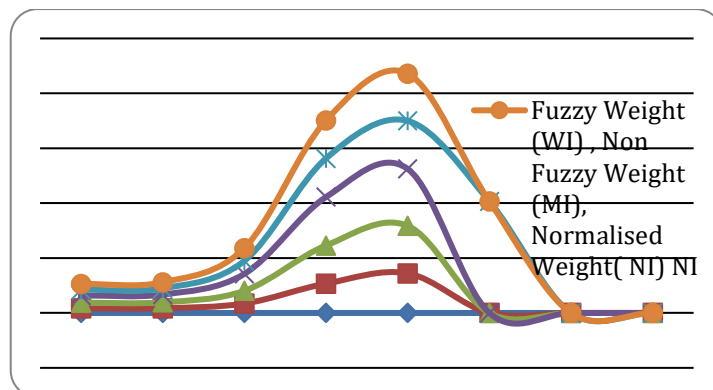


Fig 3.4

5. WEIGHTS OF ALTERNATIVES WITH RESPECT TO THE FACTORS:

The above methodology is applied to alternatives also. Before that the alternatives should be pair wise compared with respect to each factors. Let a1, a2, a3 be three alternatives.

Table 3.5 Pairwise Comparison Of Alternatives With Respect To The Factor F1 (Mother Age)

Section	A1			A2			A3		
A1	1	1	1	6	7	8	6	7	8
A2	1/8	1/7	1/6	1	1	1	1/6	1/5	1/4
A3	1/8	1/7	1/6	4	5	6	1	1	1

The above comparison matrix table has $C_i=0.1473$.so the consistency of the matrix is acceptable. Similarly geometric mean of fuzzy comparison value of alternatives with respect to the factor F1(mother age)is as follows

Table 3.6 Geometric Mean Values for Fuzzy Comparison of Alternatives;

Alternatives	G _i		
A1	3.3019	3.659	4
A2	0.2752	0.306	0.347
A3	0.7937	0.894	1
Total	4.3708	4.859	5.347
Reverse	0.2288	0.206	0.187
Increase	0.187	0.206	0.229

Normalized Non Fuzzy Relative Weight Of Each Alternatives With Respect To The Factor, Weight of Each Factors.

Table 3.7 shows the normalized non fuzzy relative weight of each alternatives with respect to the factors, weight of each factors

	Weight	A1	A2	A3
F1	0.0521	0.7539	0.0639	0.1822
F2	0.0551	0.151	0.0521	0.7968
F3	0.1166	0.4905	0.0595	0.45
F4	0.346	0.4505	0.4902	0.0594
F5	0.4302	0.747	0.1343	0.1187
Aggregated Results		0.582	0.4063	0.125

This work is done to understand the factors affecting c-section delivery through analysis using FAHP. In the table 3.8 Hierarchical orders of all factors is given based on their scores obtained from the calculated values.

Table 3.8 Results of factors in hierarchy order

Factors	A1	A2	A3
Weight	0.582	0.4063	0.125
Hierarchical order	1	2	3

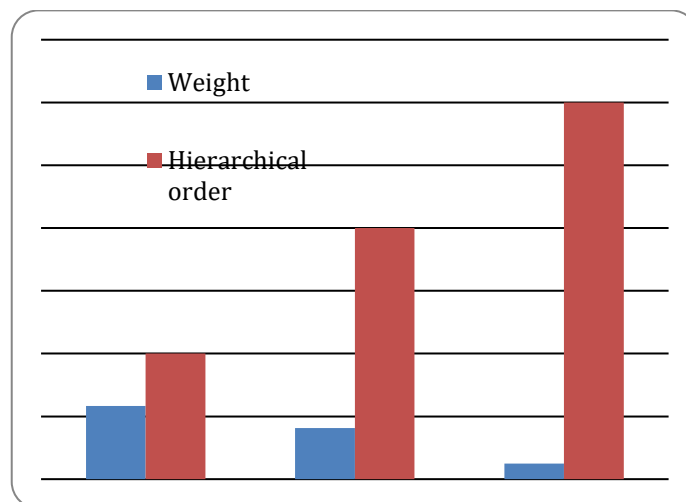


Fig 3.5

Fig 3.5 shows After analyzing these data using FAHP model the value of the alternatives was obtained such as A1 = 0.582, A2 = 0.4063 and A3= 0.125.Based on the ranking we can able to identify which alternatives can be chosen to lower the C Section rate.

6. CONCLUSION

C- and personal elements. These variables have a significant impact on women's C-section deliveries. The purpose of this study was to investigate the critical factors influencing women's decisions to deliver their babies via cesarean section. Our Fuzzy Analytical Hierarchy Process technique employed five distinct factors as input, which were prioritized according to the comparison value.

F5 (Mother's Lifestyle) obtained weight 0.4306

F4 (Mother Economic Background) obtained weight 0.346

F3 (ANC Visit) with weight 0.1166

From the comparison of these factors we have chosen three alternatives

A1- Provide better health care in rural areas/where ever it is required

A2 – Initiate to provide financial support for the pregnant ladies during pregnancy period

A3- Restructure the health education programs relating to pregnancy

These three alternatives were taken as input in Fuzzy Analytical Hierarchy Process method and ranked based on the comparison value

A1 obtained weight 0.582

A2 obtained weight 0.4063

It is clear from applying this suitable model that the alternate A1 has the highest value. Thus, it was suggested that the A1 option is provide superior medical care wherever it is needed. It might be challenging for women to go to the hospital for a prenatal checkup and delivery because hospitals are frequently located in remote locations. To ensure the safety of both the mother and the fetus, it is crucial for women to be in good health and wellness prior to conception. Because it enables the medical professional to recognize, address, and stabilize chronic illnesses, access to treatment is essential throughout pregnancy. Therefore, the study's findings led to the conclusion that government intervention is necessary to advance the health care system in any underdeveloped locations. In addition, take into account other options, such starting a campaign to give women financial help. One important factor in a woman's pregnancy is her economic background. Government initiatives include the Pradhan Mantri Matru Vandhana Yojna. The primary cause of a poor diet and infrequent prenatal visits is the family's financial situation. Better economic standing families give their ladies access to wholesome food, a better lifestyle, and frequent ANC visits. In order to better care for women, the government must offer low-income families the best possible financial help. It is imperative that the government verify if they are reaping the rewards of these programs. The information in this study will be more helpful to women and their families in caring for pregnant women.

Reference

1. Gitas G, Proppe L, Ertan AK, Baum S, Rody A, Kocaer M, et al. Influence of the second stage of labor on maternal and neonatal outcomes in vaginal births after cesarean section: a multicenter study in Germany. *BMC pregnancy and childbirth*. 2021;21:356. doi: 10.1186/s12884-021-03817-2.
2. Landon MB, Hauth JC, Leveno KJ, Spong CY, Leindecker S, Varner MW. Maternal perinatal outcomes associated with a trial of labor after prior cesarean delivery. *N Engl J Med*. 2004;351:2581–2589. doi: 10.1056/NEJMoa040405.
3. Macones GA, Peipert J, Nelson DB, Odibo A, Stevens EJ, Stamilio DM. Maternal complications with vaginal birth after cesarean delivery: a multicenter study. *Am J Obstet Gynecol*. 2005;193:1656–1662. doi: 10.1016/j.ajog.2005.04.002.
4. Menacker F, Declercq E, Macdorman MF. Cesarean delivery: background, trends, and epidemiology. *Semin Perinatol*. 2006;30:235–241. doi: 10.1053/j.semperi.2006.07.002.
5. Gardner K, Henry A, Thou S., Davis G, Miller T. Improving VBAC rates: the combined impact of two management strategies. *Australian and New Zealand Journal of Obstetrics and Gynaecology*. 2014;54:327–332. doi: 10.1111/ajo.12229.
6. Bonzon M, Gross MM, Karch A, Grylka-Baeschlin S. Deciding on the mode of birth after a previous cesarean section – An online survey investigating women's preferences in Western Switzerland. *Midwifery*. 2017;50:219–227. doi: 10.1016/j.midw.2017.04.005.
7. ACOG Practice Bulletin No. 205: Vaginal Birth After Cesarean Delivery. *Obstetrics and Gynecology*. 2019;133(2):e110–e127. doi: 10.1097/AOG.0000000000003078.
8. Eden KB, Hashima JN, Osterweil P, et al. Childbirth preferences after cesarean birth: a review of the evidence. *Birth*. 2004;3:49–60. doi: 10.1111/j.0730-7659.2004.0274.x.
9. Meddings F, MacVane Phipps F, Haith-Cooper M, Haigh J. Vaginal birth after cesarean section (VBAC): exploring women's perceptions. *Journal of Clinical Nursing*. 2007;16:160–167. doi: 10.1111/j.1365-2702.2005.01496.x.
10. Fenwick J, Gamble J, Hauck Y. Believing in birth – choosing VBAC: the childbirth expectations of a self-selected cohort of Australian women. *Journal of Clinical Nursing*. 2007;16(8):1561–1570. doi: 10.1111/j.1365-2702.2006.01747.x.
11. Gitas G, Proppe L, Ertan AK, Baum S, Rody A, Kocaer M, et al. Influence of the second stage of labor on maternal and neonatal outcomes in vaginal births after cesarean section: a multicenter study in Germany. *BMC pregnancy and childbirth*. 2021; 21(1): 356. doi:10.1186/s12884-021-03817-2

12. Landon MB, Hauth JC, Leveno KJ, Spong CY, Leindecker S, Varner MW, et al Maternal and perinatal outcomes associated with a trial of labor after prior cesarean delivery. *N Engl J Med.* 2004; 351(25): 2581–2589. doi: 10.1056/NEJMoa040405.
13. Macones GA, Peipert J, Nelson DB, Odibo A, Stevens EJ, Stamilio DM, et al Maternal complications with vaginal birth after cesarean delivery: a multicenter study. *Am J Obstet Gynecol.* 2005; 193(5): 1656–1662. doi: 10.1016/j.ajog.2005.04.002.
14. Menacker F, Declercq E, Macdorman MF. Cesarean delivery: background, trends, and epidemiology. *Semin Perinatol.* 2006; ORIGINAL PAPER / ACTA INFORM MED. 2021 DEC 29(4): 275-280 279 Vaginal Birth After Cesarean Section (VBAC) Model using Fuzzy Analytic Hierarch Process 30(5): 235-241. doi: 10.1053/j.semperi.2006.07.002.
15. Gardner K, Henry A, Thou S., Davis G, Miller T. Improving VBAC rates: the combined impact of two management strategies. *Australian and New Zealand Journal of Obstetrics and Gynaecology.* 2014; 54(4): 327-332. doi: 10.1111/ajo.12229.
16. Lundgren I, Smith V, Nilsson C, Vehvilainen-Julkunen K, Nicoletti J, Devane D, et al. Clinician-centred interventions to increase vaginal birth after caesarean section (VBAC): a systematic review. *BMC Pregnancy and Childbirth.* 2015;15(1) doi: 10.1186/s12884-015-0441-3.
17. Joyce A, Martin MPH, Hamilton PD BE, Osterman MHS MJK. Births in the United States, 2016. *NCHS Data Brief.* 2017;287:1–8.
18. World Health Organization Human Reproduction Programme A WHO statement on caesarean section rates. *Reprod Health Matters.* 2015;23(45):149–150. doi: 10.1016/j.rhm.2015.07.007.
19. Cheng YW, Eden KB, Marshall N, Pereira L, Caughey AB, Guise JM. Delivery after prior cesarean: maternal morbidity and mortality. *Clin Perinatol.* 2011;38(2):297–309. doi: 10.1016/j.clp.2011.03.012
20. Bellows P, Shah U, Hawley L, Drexler K, Gandhi M, Sangi-Haghpeykar H, Davidson C. Evaluation of outcomes associated with trial of labor after cesarean delivery after a change in clinical practice guidelines in an academic hospital. *J Matern Fetal Neonatal Med.* 2017;30(17):2092–2096. doi: 10.1080/14767058.2016.1237498.
21. K.Kaleswari, P.Sona, B,Revathi ,V.Anuradha ,R.Nandhinidevi ,Fuzzy Analytical Hierarchy process Based model for influencing factors in Academic Performance of Engineering Students. *International Journal of Future Generation Communication and Networking .Vol.14,No.1(2021), pp 305-313.*