COMPARISON OF NEONATAL OUTCOME ASSOCIATED WITH INDUCED LABOUR VERSUS PLANNED VAGINAL DELIVERY IN A LOW-RISK OBSTETRIC POPULATION

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AUTHORS’ CONTRIBUTIONS
This work was carried out in collaboration between all authors. Authors AEMK and RAM designed the study, wrote the protocol and interpreted the data. Authors NMO and RBAA anchored the field study, gathered the initial data and performed preliminary data analysis. Authors AEMK and RAM managed the literature searches and produced the initial draft. All authors read and approved the final manuscript.

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ABSTRACT

Background and Objectives: Labour induction is a common obstetric procedure with continuing rising rates. The main objectives were to study selected neonatal morbidities and outcomes in relation to induced labour versus spontaneous vaginal delivery in a low risk obstetric population.

Methods: This was a prospective, comparative study that was conducted in Omdurman maternity hospital in Sudan, 400 babies were included in the study divided equally between induced and spontaneous vaginal delivery. Data was collected using a specifically designed questionnaire including maternal and neonatal data. Chi square test was used to study the correlation between neonatal outcome and type of delivery. P value was set at 0.05 level of significance.

Results: The main results showed significant association between induction of delivery and the following maternal variables: age, level of education, parity and frequency of antenatal care visits (P values respectively .027, .02, .003, .012). With regards to neonatal outcome, the study revealed significant association between type of delivery and low Apgar score (P= 0.001) with more babies in the spontaneous vaginal delivery group having low Apgar score however the study didn’t reveal any significant differences in neonatal outcome with regards to gender, birth weight, need for resuscitation and neonatal mortality (P values respectively .071, .077, .062, .562).

Conclusion: The study showed significant difference in Apgar score between the two groups, being lower in the spontaneous vaginal delivery group but didn’t reveal any significant differences in neonatal outcome with regards to gender, birth weight, need for resuscitation and neonatal mortality.

Keywords: Pregnancy; induction; normal vaginal delivery; neonatal outcome; Sudan.

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1. INTRODUCTION

Labour induction is one of the most common obstetrical procedures, comprising about 20% of all deliveries and the rate continues to rise [1]. Indications for induction of labour have included hypertensive disorders, maternal diabetes mellitus, premature rupture of membranes, chorioamnionitis, intrauterine fetal growth restriction, isoimmunization, fetal demise, and post-term pregnancy [2].

A major concern of labor induction is that elective labour induction may increase the risk of caesarean section (CS). A number of studies indicate a higher risk of CS in nulliparous and multiparous women undergoing labour induction, compared with instances of spontaneous labour [3,4], while others suggest that labour induction is not a factor in determining the risk of caesarean section [5].

The World Health Organization (WHO) recommends induction be performed with a clear medical indication and when expected benefits outweigh potential harms [6]. Some studies of elective induction suggest higher rates of adverse outcomes, including prolonged first stage, failure to progress, intrapartum haemorrhage, admission to NICU (neonatal intensive care unit) and a higher incidence of assisted vaginal birth [7,8].

As induction of labour is not without risk, it is imperative for additional investigations to confirm or refute this observation. There is no previous study done in Sudan to compare the neonatal outcome associated with induced labour versus planned vaginal delivery (VD) in a low-risk obstetric population.

This main objectives of this research were to compare the influence of the mode of delivery in uncomplicated pregnancy, namely induced versus spontaneous vaginal birth on selected neonatal morbidities and outcomes like respiratory complications, Apgar score, birth weight, need for resuscitation and admission to the neonatal intensive care unit.

2. MATERIALS AND METHODS

This was a prospective, comparative, study that was conducted in Omdurman maternity hospital which is the largest maternity hospital in Sudan during the period June 2013 to June 2014. 400 babies were included in the study, 200 were outcome of normal spontaneous VD and the other 200 were outcome of induced labour. Only babies who were term and a product of singleton, uncomplicated pregnancy were included in the study. The exclusion criteria included those babies who were outcome of complicated pregnancy with maternal illness of any kind, preterm delivery, twins’ delivery, assisted delivery and those women who refused to participate in the study. Sampling technique was simple random method.

Data was collected using a specifically designed questionnaire filled out by the researchers, maternal data included age of the mother, occupation, level of education, social class, antenatal care, gestational age, parity, type of delivery and indication for induction, method of induction and outcome of induction. Neonatal data included gender, gestational age, birth weight, Apgar score at 1 and 5 minutes, resuscitation, need and indication for neonatal unit admission, clinical diagnosis, duration of stay in the neonatal unit and outcome.

Neonatal outcome was compared between the two groups, low birth weight is defined as weight less than 2.5 Kg, low Apgar score if the score is less than 7 at 5 minutes. Data was analyzed by statistical package for social sciences (SPSS) version 21, frequency analysis for back ground variables was conducted. Chi square test was used to study the correlation between neonatal outcome and type of delivery. P value was set at 0.05 level of significance.

The women included in the study groups were mostly within the same age range and as the maternity hospital is the main district maternity hospital, the participants were also from similar social classes and level of education. Geographic locations were more or less in the same area. This was done in order to avoid any confounding factors that may affect the results. There was no limitations to ethnic origins as the variety is vast.

Ethical approval for conducting this research was granted by the ethical committee of Sudan medical specialization board. Prior informed consent was obtained from individual subjects with full explanation of the study.

3. RESULTS

During the study period a total of 400 babies who fulfilled the criteria were included in the study. They were further divided into two groups on the basis of mode of delivery. Regarding the age distribution of the two groups, the age group 20-34 years was the commonest age group with VD comprising 181 (90.5%) and induced delivery 162 (81%), for those <20 years, VD were 13 (6.5%) and induced delivery 19 (9.5%) with significant association between induction of labour and age (P = .027) Table 1.
Table 1. Age distribution of the two groups

<table>
<thead>
<tr>
<th>Maternal age in years</th>
<th>Groups</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Induced delivery</td>
<td>SVD</td>
</tr>
<tr>
<td>&lt; 20</td>
<td>Count</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>% within maternal age</td>
<td>59.4%</td>
</tr>
<tr>
<td></td>
<td>% within groups</td>
<td>9.5%</td>
</tr>
<tr>
<td>20-34</td>
<td>Count</td>
<td>162</td>
</tr>
<tr>
<td></td>
<td>% within maternal age</td>
<td>47.2%</td>
</tr>
<tr>
<td></td>
<td>% within groups</td>
<td>81.0%</td>
</tr>
<tr>
<td>35-40</td>
<td>Count</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>% within maternal age</td>
<td>75.0%</td>
</tr>
<tr>
<td></td>
<td>% within groups</td>
<td>9.0%</td>
</tr>
<tr>
<td>&gt; 40</td>
<td>Count</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>% within maternal age</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>% within groups</td>
<td>.5%</td>
</tr>
<tr>
<td>Total</td>
<td>Count</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>% within maternal age</td>
<td>50.0%</td>
</tr>
<tr>
<td></td>
<td>% within groups</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

SVD Spontaneous vaginal delivery

With regards to parity, the results showed that in the multiparous group, there were 115 (57.5%) VD and 85 (42.5%) induced delivery, where as in the primagravida group, there were 85 (42.5%) VD and 115 (57.5%) induced delivery, with significant association between induction of labour and parity ($P = .003$).

Regarding the level of education, those who received university education in the induction group were 63 (57.8%), secondary education 63 (52.9%) and illiterate were 13 (6.5%), whereas in VD group university graduates were 46 (42.2%), secondary education 56 (47.1%) and illiterate were 29 (14.5%) with significant association between level of education and induction of labour ($P = .022$). Our data revealed that 152 (76%) women in the induced group had regular antenatal care where as 129 (64.5%) the VD group had regular antenatal care, indicating significant association between type of delivery and antenatal care ($P = .012$). Regarding the obstetric outcome of induction of labour, 146 (73%) delivered vaginally and 54 (27%) delivered by emergency cesarean section. Regarding the indications for induction, those with postdates were 149 (74.5%), pregnancy induced hypertension 22 (11%), prolonged rupture of the membranes 12 (6%), oligohydraminos 9 (4.5%) and gestational diabetes 7 (3.5%) Fig. 1.

The commonest method used for induction was prostaglandins comprising 150 (75%) women, followed by artificial rupture of membranes and syntocinon in 42 (21%), Sweeping was applied in 6 (3%) and artificial rupture of membrane alone in 2 (1%).

Regarding neonatal outcome, from the induction group 115 (57.5%) babies were males and 85 (42.5%) were females, whereas from the VD group, 97 (48.5%) were males and 103 (51.5%) were females, with insignificant correlation between type of delivery and gender ($P = .071$). The results showed that in those born via SVD 199 (99.5%) were live births and in those induced 195 (97.5%), while 5 (2.5%) were stillborn in induction group, whereas only 1 (0.5%) was stillborn in the SVD group with lack of association between still birth and type of delivery ($P = .07$). In the induced group, 189 (94.5%) of the newborns cried immediately and 11 (5.5%) required resuscitation. In SVD group, 180 (90%) cried immediately and 20 (10%) cried after resuscitation and there was no significant association between need of resuscitation and type of delivery ($P = .062$).

When comparing the Apgar score between the two groups, our data indicated that there were 174 (87%) babies in the induced group and 164 (82%) in the SVD group with Apgar score > 7 at 5 minutes, whereas those with Apgar score < 7 at 5 minutes in the induced group were 3 (1.5%) and 10 (5%) in the SVD group with significant association between type of delivery and low Apgar score ($P = .001$) Fig. 2.

The results showed that birth weight > 2.5 kg in the induced delivery group was found in 194 (97%) babies and in 184 (92%) babies in the SVD group. Birth weight of less than 2.5 was found in 6 (3%) babies in the induced group and in 15 (7.5%) babies in the SVD group. Birth weight < 1.5 kg comprised 1 (0.5%) baby in the SVD group and nil in the induction group with insignificant association between birth weight and type of delivery ($P = .077$) Fig. 3.
Fig. 1. The various indications for induction

GDM: gestational diabetes  IUGR: intrauterine growth restriction  PIH: pregnancy induced hypertension  PROM: prolonged rupture of membranes

Fig. 2. Apgar score at 5 minutes in the two groups

Our data indicated that 25 (12.5%) babies delivered by SVD required NICU admission, whereas 32 (16%) babies in the induction group required NICU admission with no significant association between type of delivery and NICU admission ($P = 0.067$). The commonest cause of admission was birth asphyxia,
comprising 17 (8.5%) in the induction group, and 16 (8%) in the SVD group, followed by meconium aspiration syndrome, comprising 7 (3.5%) from induction admissions and 6 (3%) from the SVD group. Fig. 4 shows the different indications for admission in the two groups.

![Birth weight in the two groups](image)

**Fig. 3. Birth weight in the two group**

![Indications for admission in the two groups](image)

**Fig. 4. Indications for admission in the two groups**
Regarding the respiratory complications, the results showed that there were 21(10.5) babies in the induction group compared to 15(7.5%) in the SVD group with respiratory complications indicating insignificant association between type of delivery and respiratory problems (P=.295).

Regarding the outcome of the babies admitted to the neonatal unit, in the SVD group 99.5% were discharged home in good condition with mortality rate of .5%. Where as in the induced group, 99% were discharged with 1% mortality rate, with no significant association between type of delivery and NICU outcome (P = .562).

4. DISCUSSION

Induction of labor is among the most common obstetric interventions in order to achieve a vaginal delivery when the benefits of expeditious delivery outweigh the potential risk of continuing pregnancy [9]. The present study is an attempt to compare the neonatal outcome associated with induction of labour versus planned SVD in a low-risk obstetric population. Our data indicated that the age range of the mothers was found mostly between 20-34 years in both groups, being slightly higher in the SVD group, this is different From a study done in Brazil assessing the induction of labour outcomes and associated factors in Latin America, where the induction rate was higher in women 35 years or older and this age group was found to be a risk factor for induction [10]. This could probably be linked to the vast number of candidates in the study were from different countries and so many confounding factors were not totally excluded in the criteria, also women who requested the induction were included in that study.

In our study, induction rate was higher in nulliparous women compared to multiparous which is different from the SVD group, with significant correlation between parity and type of delivery. Other studies focused on parity and caesarean section association where induction was associated with an increased likelihood of cesarean delivery for nulliparous but not multiparous women with modest increases in the risk of instrumental delivery and shoulder dystocia for all women [11].

Our data indicated that those who received university and secondary education were more in the induction group whereas primary education and illiteracy were commoner in the SVD group with significant correlation between type of delivery and level of education. This is similar to a study done in Africa and Asia that indicated ten or more years of education were more frequent in women undergoing induction compared to SVD [12]. The study revealed that the majority of women in both groups had regular antenatal care visits and this was higher in the induction group with significant correlation between type of delivery and antenatal care visits. This is similar to the study done in Africa and Asia where induction of labour was associated with 4 or more antenatal visits [12].

Our study revealed that most of the babies in the two groups had normal birth weight with insignificant association between birth weight and type of delivery, this is quite comparable to other similar studies that showed insignificant differences in mean birth weight between the two groups [13,14]. Our data indicated that, there were more babies in the SVD group than the induced group with low Apgar score at 5 minutes with significant association between type of delivery and low Apgar score, this finding is similar to a study done in Nepal in 2008 [15], however it is different from other similar studies [16], this difference could be due to differences in active management of labour and resuscitation modes. The present study revealed no significant association between type of delivery and need for admission to the neonatal unit, this is quite similar to a study done in USA [17], however it is different from a study done in Scotland where more babies in the induced group needed admission to the neonatal unit [18], this difference could be due to the smaller sample size in our study and local policies regarding indications for admission.

Our data indicated no difference in mortality rates between the induced and SVD group, this is reassuring that elective induction of labour is not associated with increase in perinatal mortality. Other studies reported similar findings, Sanchez-Ramos in 2003 have concluded that labor induction at 41 weeks or more showed no difference in perinatal mortality [19]. Another similar study found that elective induction was not associated with increased perinatal mortality at any term gestational age (37–40 weeks) compared with expectant management [20].

5. CONCLUSION

Induced or spontaneous labour has implications on the eventual mode of delivery and neonatal outcome. The present study indicated significant association between the type of delivery and the following maternal variables: age, parity, level of education and frequency of antenatal care visits. The study showed significant difference in Apgar score between the two groups, being lower in the SVD group but didn’t reveal any significant differences in neonatal outcome with regards to gender, birth weight, need for resuscitation and neonatal mortality.
COMPETING INTERESTS
Authors have declared that no competing interests exist.

REFERENCES