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ORIGINAL ARTICLE

Efficacy of Dexamethasone on Latent Phase During Induction of Labour

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Abstract

Background: **The hypothalamus, pituitary gland, and adrenal glands form the axis around which the process of giving birth revolves. Fetal adrenal steroid hormones change the noncontractile myometrium into the contractile state, affecting the placenta and membranes.**

Aim: **The objective of this research was to determine the effect of intramuscular dexamethasone injection on the time between labor induction and the commencement of active phase of labor, as well as the duration of the active phase.**

Patients and methods: **This was a double-blind, randomized, controlled trial conducted on pregnant women visiting the maternity ward of Al-Hussein University Hospital for 12 months. 200 pregnant women (according to the sample volume frame) who met the inclusion criteria were studied within the study's timeframe. The study followed the Ethics Board of the Egyptian Ministry of Health and an informed consent, verbal and written, was obtained from each participant and or her first-degree relatives in the study.**

Results: **Dexamethasone Group showed significantly shorter durations of all the stages of labor compared with the distilled water group.**

Conclusion: **Dexamethasone injection could be considered as a useful and safe method for the induction of labor and in shortening of the labor duration.**

Keywords: Dexamethasone, Induction of labour, Latent phase, Pregnancy

1. Introduction

The birthing process starts in the axis of the hypothalamus, pituitary, and adrenal glands. Human fetal adrenal glands secrete steroid compounds that change the myometrium from a noncontractile to a contractile state and have effects on the placenta and membranes.[1]

Due to its high corticotropin-releasing hormone (CRH) production, the placenta may be involved (Corticotrophin releasing hormone). Before the third trimester, the fetal adrenal glands do not make a lot of cortisol. In late pregnancy, the fetus's cortisol and DHEA−S (Dehydroepiandrosterone sulfate) levels rise, increasing maternal estrogens, particularly sterols.[2]

The placental CRH is unaffected by cortisol's negative feedback. During the last 12 weeks of pregnancy, the fetal concentration of CRH increases. This results in a modification of uterine contractility, stimulation of membranes to produce more prostaglandins, stimulation of corticosteroid production from placental adrenaline, and a rise in estrogen concentration.[3]

This will disrupt the estrogen-to-progesterone ratio and result in the production of contractile proteins. In fact, the rise in CRH at the end of gestation confirms the existence of a placental-fetal clock.[4]

There is a possibility that some women who undergo cesarean delivery will endure a protracted latent period of labor. The prolonged latent phase is related to an increased risk of labor problems,

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including postpartum hemorrhage, chorioamnionitis, surgical delivery, and further hospital stays for the mother and newborn.[2]

Induction of labor can be accomplished through medical and nonmedical methods. The typical method for induction involves the use of oxytocin, which may result in postpartum atony and water intoxication. The risks of prostaglandins include overstimulation of the uterus and problems like as nausea, vomiting, diarrhea, and fever in the mother.[5]

The purpose of this research was to examine the influence of intramuscular dexamethasone injection on the period between labor induction and the beginning of active phase of labor, as well as the duration of active phase.

2. Patients and methods

This was a double-blind, randomized, control trial conducted on pregnant women visiting the maternity ward of Al-Hussein University hospital from July 2021 to July 2022 (12 months). 200 pregnant women (according to the sample volume frame) who met the inclusion criteria were studied within the study's timeframe. In accordance with the Egyptian Ministry of Health's Ethics Council, verbal and written informed consent was obtained from each participant and her first-degree relatives. Ethical approval for the research was obtained from Faculty of medicine, Al Azhar University.

Inclusion criteria: vertex presentation, singleton fetus, favorable cervix with a Bishop score of 7 or higher, intact fetal membranes, and absence of contraindications for vaginal delivery; gestational age (38–42) weeks as determined by a verifiable date for the last menstrual period and first-trimester ultrasound evaluation.

Exclusion criteria: Placenta previa, intrauterine growth retardation, nonvertex presentation, previous cesarean section (CS), maternal medical disorders such as diabetes mellitus and severe pre-eclampsia, preterm labor, and premature rupture of membrane, significant vaginal bleeding, probable placental abruption, fetal macrosomia greater than 3.5 kg (estimated by u/s), vaginal birth after cesarean (VBAC) and poor Bishop score are indications for CS.

Method of the study: Women who were pregnant at the time of this randomized controlled trial were randomly assigned to receive either 2 mL of dexamethasone sodium phosphate 8 mg or 2 mL of distilled water. Although the researcher conducted the initial vaginal examination and calculated the Bishop score, his colleagues injected the participants with either dexamethasone or distilled water, and neither the individuals nor the researcher knew which they were receiving.

Randomization and allocation with concealment: Pregnant women who meet the inclusion criteria were assigned a code from 1001 to 1100 that was plotted on a graph. The codes were then fed into a computer program for random selection to any of our 2 groups.

All women were submitted to: Verbal and written consent.

Complete history: maternal data: clinical history was obtained: Personal history: Name, age, occupation, residence, Menstrual history i.e. regular, irregular, Obstetric history: Gravidity, parity, previous manner of delivery, pre-eclampsia or gestational diabetes in any prior pregnancies, past history: Medical conditions, particularly hypertensive disorders and diabetes, surgical and gynecological history, and other maternal complaints, such as nausea, vomiting, palpitations, and headaches, are considered. Clinical examination: general examination, vital signs, including blood pressure, pulse, temperature, weight, height, chest and cardiac examination, lower limb edema, and vaginal examination, are used to determine: initial cervical dilatation and effacement, condition of fetal membranes, fetal head station, fetal head position, and pelvic adequacy. Laboratory investigation: complete blood count (CBC) and random blood sugar.

Radiological examination: *Trans*-abdominal ultrasonography and dopplex.

Induction of labor: Ultrasonography and Dopplex are utilized for fetal well-being monitoring. Via computer list, each participant received a prefilled syringe containing 2 mL of a colorless solution [either dexamethasone (8 mg) or pure water]. During half an hour to 6 h after the first dosage the labor induction was started via Oxytocin using the following protocol: a 5 units in 500 mL of normal saline or ringer's solution = (10 mu/ml), each ml = 15 drops, each drop = 10mu/15 drops = about 1.33 mu for each drop, initial dose of oxytocin: 2.6–4 mIU/min = about 2–3 drops/min, Increase interval 30 min, Dosage incresement to 4 mIU = about 2–3 drops, Usual dose for good labor 21–26 mIU/min = about 16–20 drops and Maximum dose 40 mIU/min = 60 drops/min. The duration of time from induction until the start of labor was recorded (a cervical dilatation of 4 cm plus 3 forceful contractions over a 10 min span each last from 40 to 60 s). Evolution of the working phase as depicted by a partographic representation: every 2 h, a vaginal exam was performed to record the frequency, length, and degree of cervical dilatation associated with labor. Fetal heart rate was recorded every

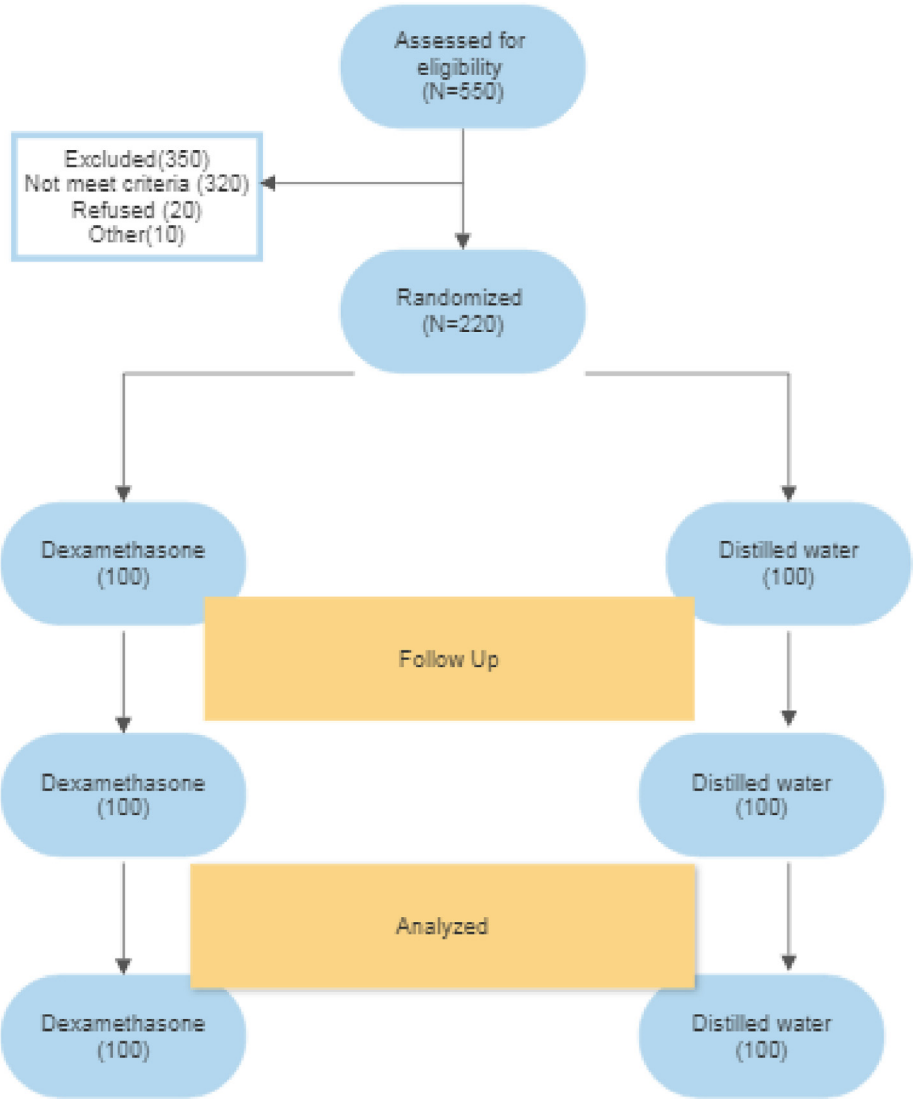

Fig. 1. PRISMA flowchart of our study. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

10 min, mother vital indicators such as blood pressure, pulse, temperature, and random blood sugar levels were measured every hour, and the fetal position and station were recorded simultaneously.

Assessment of labor process was done by a partograph: Partograph is a diagram that charts each stage of labor. Cervical dilatation against time in hours is used to gauge labor progress, and any changes in the mother's and baby's vital status are recorded. WHO developed and rigorously evaluated the partograph. After the baby was born, doctors recorded how long the first stage of labor lasted. Each individual has their own unique partographic diagram drawn out. Time spent in the second stage of labor was measured. Observations were made about the duration of placental separation. The APGAR score was used to assess the health of the newborn, and any negative maternal reactions after giving birth were recorded (e.g. vital sing abnormality and any maternal postpartum hemorrhage). Statistical analysis: IBM-SPSS version 25.0 (August 2017) was used for statistical analysis because it is the most recent version available from IBM-Chicago, United States. Numbers, percentages, the average, and the standard deviation (SD) are all displayed. Statistics were represented by means and standard deviations, whereas qualitative information was conveyed by means of numbers and percentages. To evaluate differences in mean scores between two sets of data, we used the Student *t*-test. The Earson χ^2 test was used to make percentage comparisons among sets of qualitative data (Fig. 1).

3. Results

Table 1.

Table 1. Age of the study mothers.

Mean	22.91
Median	22.00
Std. Deviation	4.075
Minimum	16
Maximum	35

The ages of participants ranged from 16 to 35 years old, with an average of about 23 (Fig. 2).

The study population's mean gestational age was around 39.7 weeks, with a range of 38–42 weeks. Almost two-thirds of the participants in the study

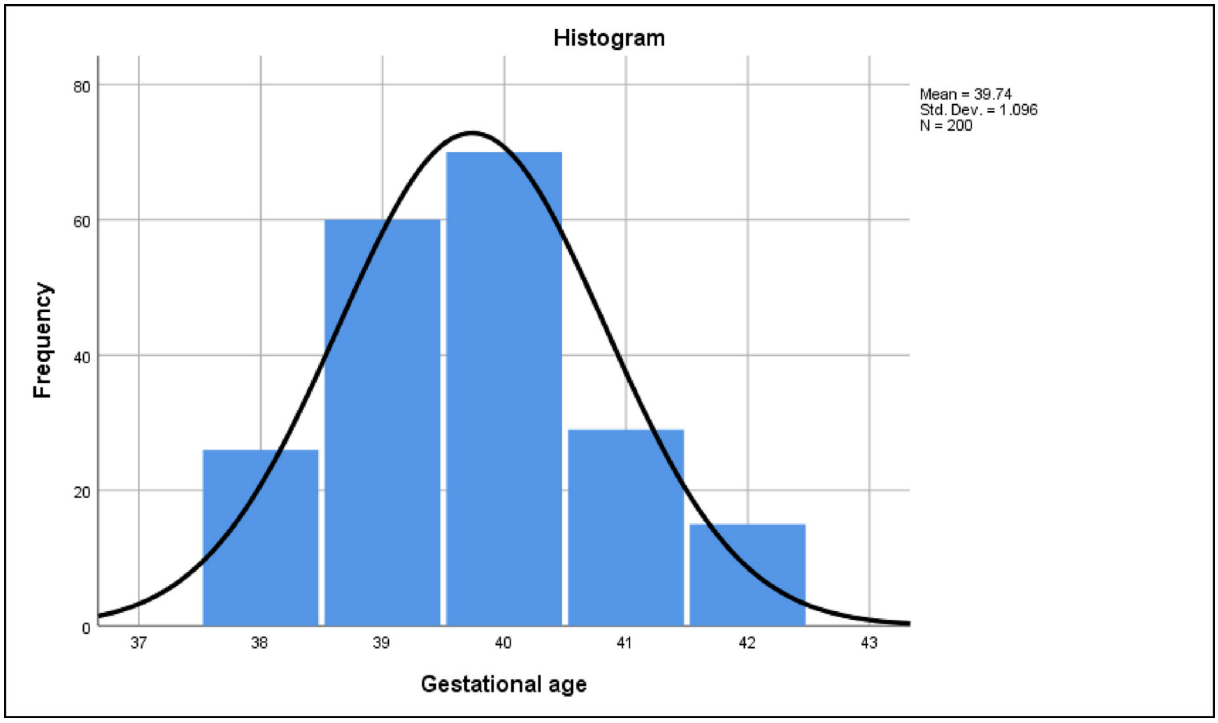

Fig. 2. Gestational age.

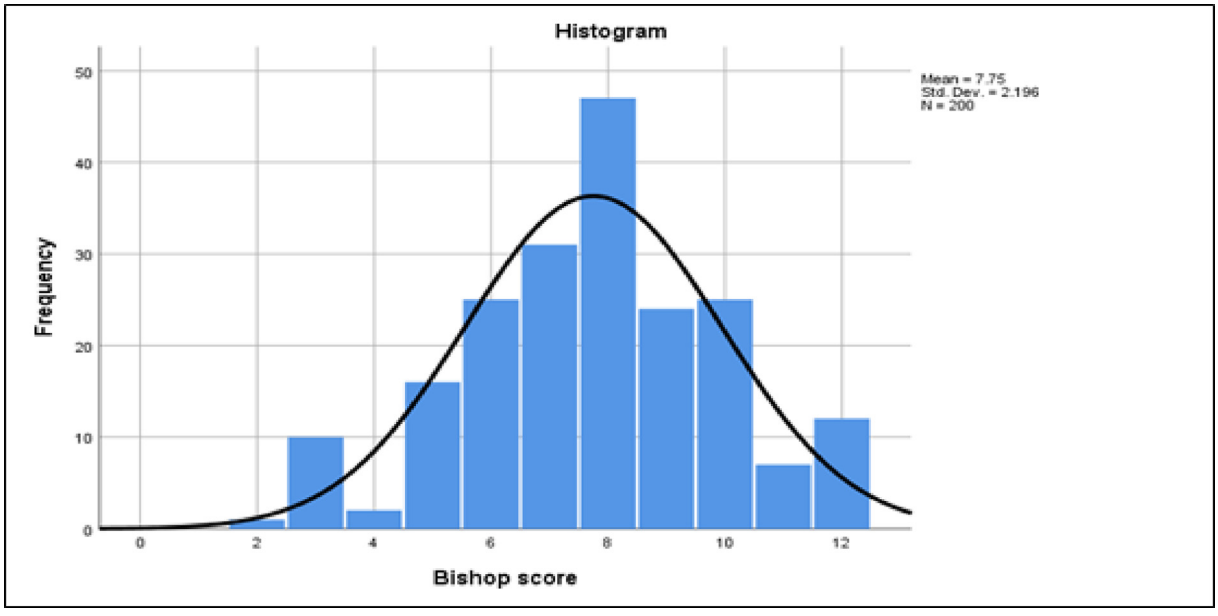

Fig. 3. Bishop score.

Table 2. Fetal weight and heart rate.

	Fetal weight	FHR
Mean	3239.25	129.94
Median	3200.00	125.00
Std. Deviation	295.395	18.919
Minimum	2800	90
Maximum	3500	180

were either 39 or 40 weeks along in their pregnancies (Fig. 3).

The mean Bishop score of the study population was 7.75, with a wide range from 2– to 12 (Table 2).

The fetal weight of the study population ranged from 2900 to 3500 gm, with a mean of 3240 gm.

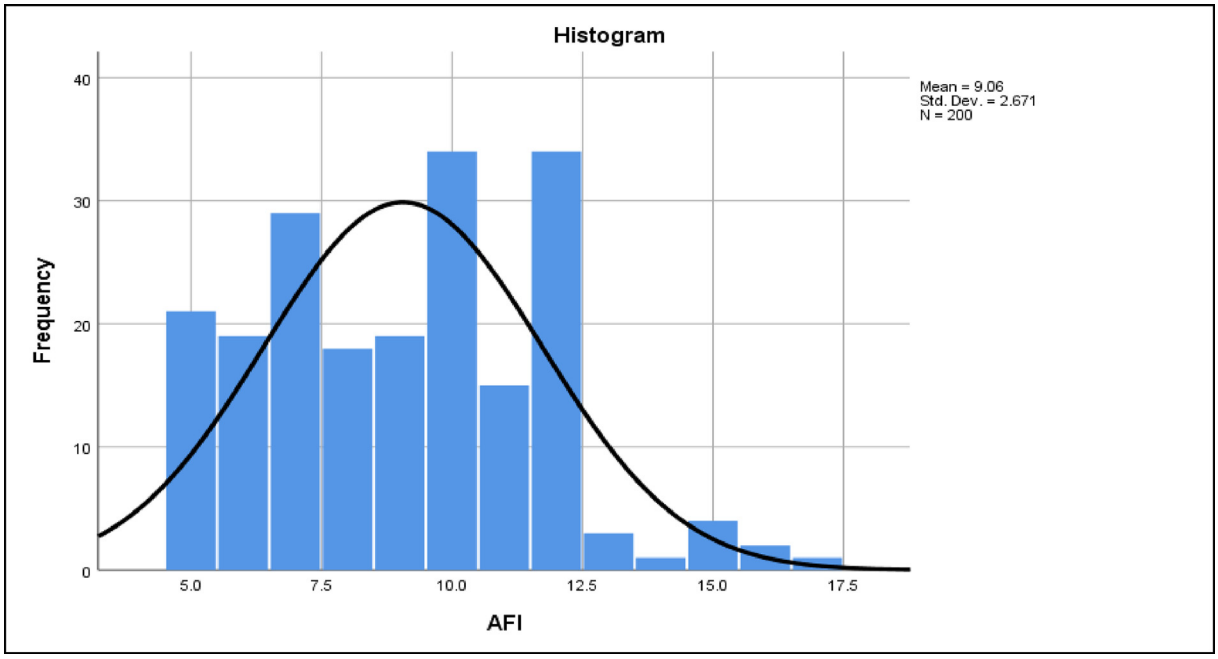

Fig. 4. Amniotic fluid index.

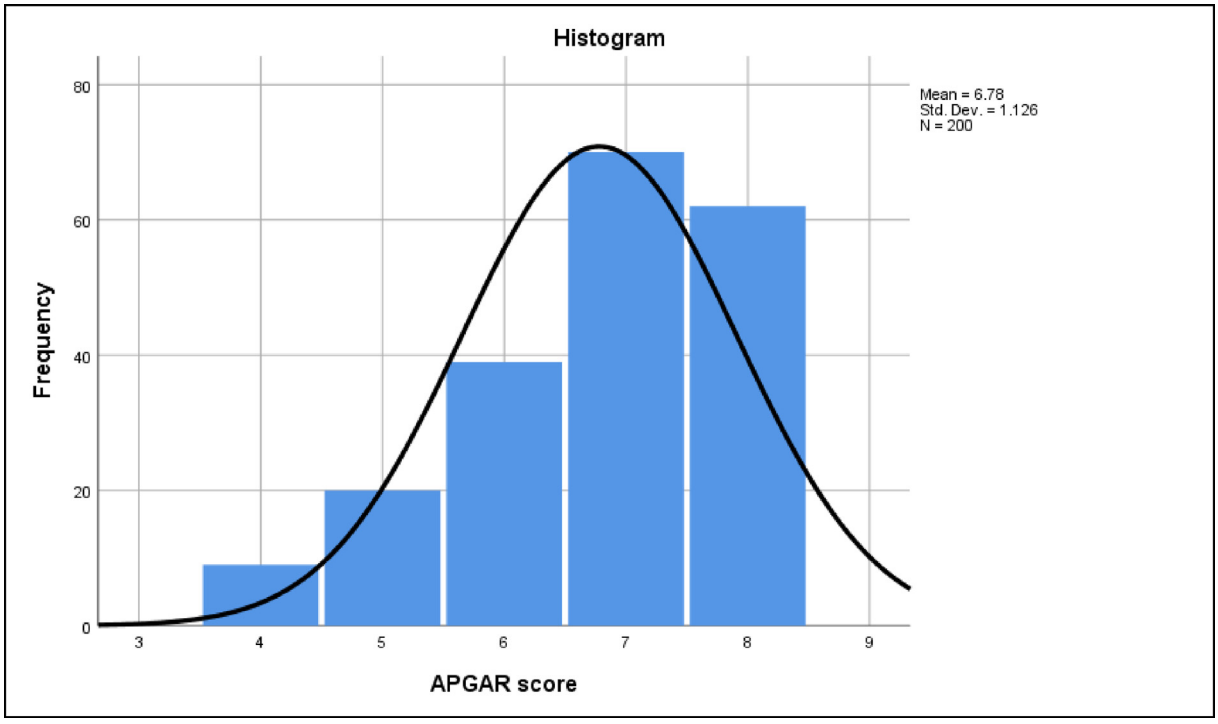

Fig. 5. APGAR score.

Table 3. Comparison between the two groups as regards the maternal and fetal clinical data.

	Dexamethasone group	Distilled water group	*T* test	*P* value
Age	23.25 ± 3.97	22.57 ± 4.17	1.181	0.239 (NS)
Gestational age	39.71 ± 1.09	39.76 ± 1.10	0.322	0.748 (NS)
Bishop score	7.60 ± 2.17	7.90 ± 2.22	0.966	0.335 (NS)
Fetal weight	3216.0 ± 271.2	3262.5 ± 317.5	1.114	0.267 (NS)
FHR	129.08 ± 19.57	130.80 ± 18.30	0.642	0.522 (NS)
AFI	8.88 ± 2.92	9.24 ± 2.39	0.953	0.342 (NS)
SBP	110.00 ± 7.65	114.00 ± 8.17	2.574	0.031 (S)
DBP	74.10 ± 7.67	74.10 ± 8.42	0.002	0.999 (NS)
RBG	96.51 ± 14.83	93.94 ± 15.05	1.217	0.225 (NS)
HB	11.38 ± 0.96	11.23 ± 0.84	1.180	0.240 (NS)
APGAR score	6.61 ± 1.14	6.95 ± 1.10	2.155	0.032 (S)

AFI, amniotic fluid index; DBP, diastolic blood pressure; FHR, fetal heart rate; HR, heart rate; RBG, random blood glucose; SBP, systolic blood pressure.

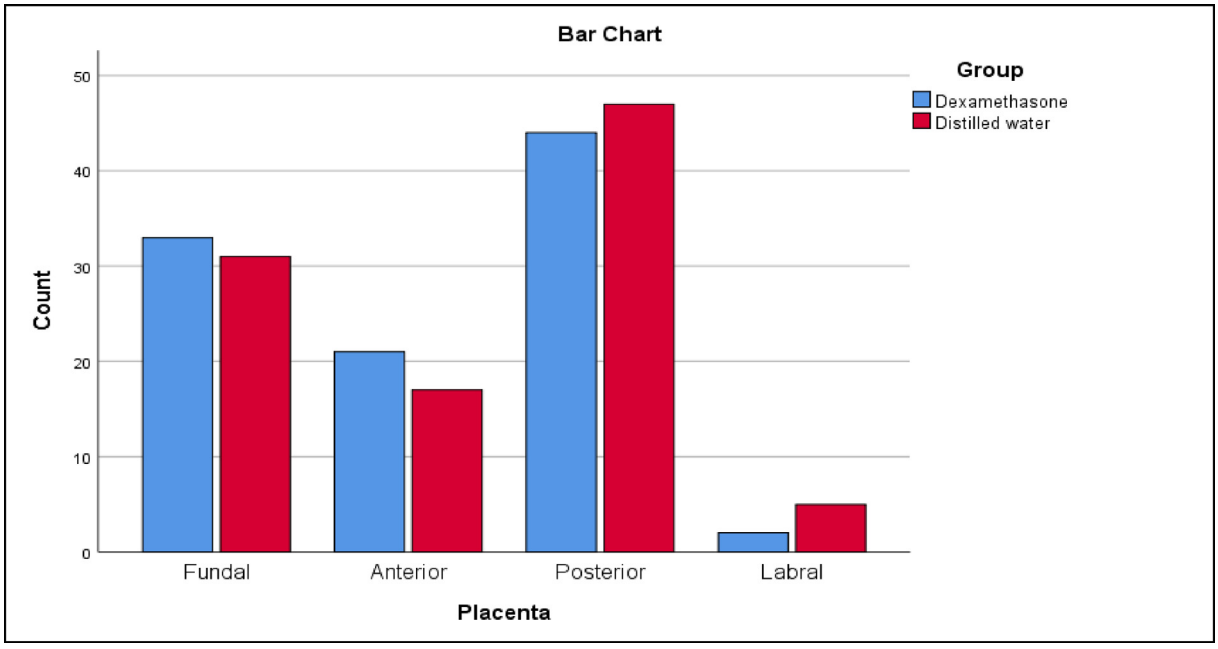

Fig. 6. Comparison amongst the two groups as regards the placenta.

Regarding the fetal heart rate, there was a wide range from 90 to 180 b/min, with a mean of around 130 beats/min (Fig. 4).

The mean amniotic fluid index of the study population was 9, and ranged from 5 to 17 (Fig. 5).

The mean APGAR score of the study population was around 6.8, with a range from 4 to 8 (Table 3).

All of the clinical maternal and fetal data in this table demonstrate no statistically significant differences between the two groups. The only noticeable difference between the distilled water group and the dexamethasone group was a somewhat significant increase in systolic blood pressure. Regarding the APGAR score, it was significantly lower but not clinically important among dexamethasone group compared with distilled water one (Fig. 6).

There was nonsignificant difference between the two groups regarding the placental position (Table 4).

This table shows that the Dexamethasone group showed significantly shorter durations of all of

Table 4. Comparison between the two groups as regards the stage of labor.

	Dexamethasone group	Distilled water group	*T* test	*P* value
L period	3.810 ± 0.815	6.13 ± 0.640	22.371	**<0.001(HS)**
A stage	3.564 ± 0.536	5.363 ± 0.896	17.225	**<0.001(HS)**
2nd	0.393 ± 0.121	0.870 ± 0.330	12.258	**<0.001(HS)**
3rd	0.096 ± 0.035	0.258 ± 0.048	24.416	**<0.001(HS)**

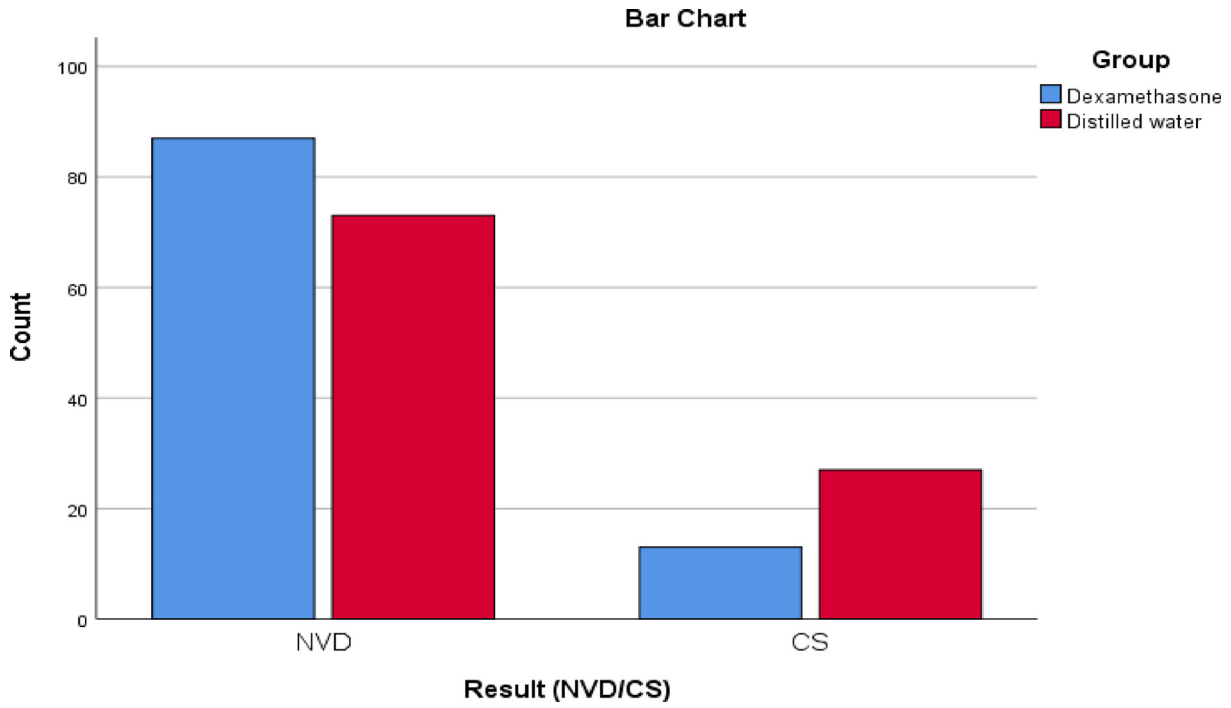

Fig. 7. Comparison between the two groups as regards the outcome of pregnancy.

stages of labor compared with the distilled water group (Fig. 7).

The Dexamethasone group showed significantly lower prevalence of CS compared with the distilled water group.

4. Discussion

Labor induction is a treatment used during pregnancy to produce uterine contractions before to the onset of labor.[6]

The objectives of the study were to evaluate whether or not intramuscular dexamethasone injection decreased the duration of active labor and the period between induction of labor and the onset of labor. The mean age of the study population was approximately 23 years, with a wide range between 16 and 35. This was more or less similar to the study of Gharib et al.,[6] whose cases had a mean of 21 years, but with narrower range from 18 to 26 years only. The mean gestational age of the study population was around 39.7 weeks, with a range from 38 to 42 weeks. Around two thirds of the study population had either a gestational age of 39 or 40 weeks. The study of Gharib et al.,[6] included only cases with prolonged pregnancies, so their mean gestational age was around 41 weeks with a range from 40 to 42 weeks. The same was seen in the study of Ahmed et al.,[3] where The average duration of gestation was 40.5 weeks; also with a range from 40 to 42 weeks.

In the present study, the population's mean Bishop score was 7.75, with a wide range of 2–12. The study of Gharib et al.,[6] found lower Bishop scores, with a range from 2 to 4 only and a mean of 3.5. after 6 h of intervention, they found that the Bishop score raised to 5.88 among dexamethasone group and 5.19 among control group, with a significant difference. According to Ahmed et al.[3] research, a statistically significant difference existed amongst the Dexamethasone group's mean Bishop score of 6.4 and the control group's score of 4.8.

The mean AFI of the study population was 9, and ranged from 5 to 17.

Nearly half of the cases had posterior placenta (45.5 %), followed by fundal placenta (seen in 32 % of the cases), then anterior (19 %) and lastly labral (3.5 %).

We found that there are wide ranges for all of the stages of labor, with a mean L period of around 5 h, A stage of 4.5 h, mean second stage of around 0.63 h and a mean third stage of around 0.18 h.

Nearly all of the cases had normal blood pressure, with a mean of around 112 mmHg for systolic and 74 mmHg for diastolic blood pressure. This was similar to the study of Ahmed et al.,[3] who mentioned that the mean blood pressure was around 113/75 mmHg. A similar result was found in the study done by Elmaraghy et al.[7]

The systematic review of Mohaghegh et al.,[8] showed that the dexamethasone injection do not

cause significant rise of maternal blood pressure among their studied researches.

Regarding the random blood sugar, the mean blood sugar was around 95 mg/dL with a range from 68 to 130 mg/dL.

All of the cases were found to have normal hemoglobin levels or mild anemia, with levels ranging from 10 to 13.5 gm/dL and with an average 11.3 gm/dl.

The mean APGAR score of the study population was around 6.8, with a range from 4 to 8.

Most of the cases delivered by normal vaginal delivery (80 %) and the other 20 % delivered by CS.

After comparing the two groups' clinical maternal and fetal data, we discovered no statistically significant differences. The only exception was the mild significant rise of systolic blood pressure among distilled water group compared with the Dexamethasone group. Also, we found that there was non-significant difference among the two groups regarding the placental position. All of these variables showed non-significant differences in the study of Ahmed et al.[3] However, in the systematic review of Mohaghegh et al.,[8] they found that 4 of their included studies showed significant drop of Bishop score among the dexamethasone groups compared with the control ones.

Across the two groups, the Dexamethasone group had noticeably shorter durations of all phases of labor compared with the Distilled Water group. It was found that the dexamethasone group had considerably shorter durations of all phases of labor compared with the control group, which was consistent with the findings of studies by Gharib et al.[6] and Elmaraghy et al.[7] The study of Ahmed et al.,[3] found that dexamethasone injection was associated with significant shortening of the induction phases only of labor but not the active second stage of labor.

According to a comprehensive review by Mohaghegh et al., dexamethasone has the potential to significantly shorten the induction-active phase interval and the duration of the first stage of labor without causing any harmful effects on the mother or the baby.

The study done by Elmaraghy et al.,[7] showed nonsignificant effect of dexamethasone on the fetal outcome.

In the current study, the Dexamethasone Group showed significantly lower prevalence of CS compared with the distilled water group. The systematic review of Mohaghegh et al.,[8] found that dexamethasone injection decreased the risk for CS by around 50 %, with a significant difference.

Our recommendations for incoming researchers are to assess the safety and efficacy of misoprostol use in comparison to other drugs in women undergoing induction of labor due to intrauterine fetal death.

4.1. Conclusion

Dexamethasone injection could be considered as a useful and safe method for the induction of labor and in shortening of the labor duration.

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

Authorship

All authors have a substantial contribution to the article.

Conflicts of interest

The authors declared that there were no conflicts of interest.

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