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### Determination of fetal head station: Do professors and residents of obstetrics and gynecology reach an agreement?

**Background:** Determining fetal head station is an important factor during labor progress. This study evaluated the agreement and correlation between professors and residents of obstetrics and gynecology in the determination of fetal head station based on a vaginal examination during labor.

**Methods:** In this cross-sectional study, term pregnant women with cephalic presentation in an active phase of labor underwent vaginal examinations simultaneously by residents and professors of obstetrics and gynecology. Their examination findings regarding a fetal head station, cervical dilation and effacement were recorded both by professors and the residents. Data were analyzed by SPSS version 16 using Spearman's correlation and Intraclass Correlation Coefficient tests between results obtained by two groups of assessors (residents and professors).

**Results:** Our data analysis showed that the agreement between obstetricians and residents for cervical dilatation, cervical effacement, and a fetal head station was 0.88, 0.9, and 0.67 respectively ( $P < 0.001$ ). The correlation between obstetricians and residents for determination of cervical dilatation, cervical effacement, and a fetal head station was 0.77, 0.79, and 0.52, respectively ( $P < 0.001$ ).

**Conclusion:** The agreement and correlation between professors and residents in obstetrics and gynecology about the determination of fetal head station are lower than those for cervical dilatation and effacement. Because of the importance of accurate determination of fetal head station in the first stage of labor, a new approach (new invented device for determine fetal head station) should be developed for determining fetal station.

**Keywords:** Fetal station; Labor, Obstetric; Vaginal examinations

### تعیین جایگاه سر جنین: آیا اساتید و دستیاران زنان و زایمان به توافق می‌رسند؟

**زمینه و هدف:** تعیین جایگاه سر جنین یک عامل مهم در تعیین پیشرفت زایمان است. این مطالعه توافق و ارتباط بین اساتید و رزیدنت های زنان و زایمان در تعیین ایستگاه سر جنین بر اساس معاینه واژینال هنگام زایمان را بررسی می کند.

**روش:** در این مطالعه مقطعی، زنان باردار با حاملگی ترم و تظاهرات سفالیک که در مرحله فعال زایمان قرار دارند، بطور همزمان توسط رزیدنت ها و اساتید زنان و زایمان معاینه واژینال شدند. یافته های معاینه آنها در مورد جایگاه سر جنین، اتساع و نرم شدگی دهانه رحم توسط اساتید و رزیدنت ها ثبت شد. داده ها با استفاده از نرم افزار SPSS نسخه ۱۶ و استفاده از آزمون های همبستگی اسپیرمن و ضریب همبستگی Intraclass بین نتایج به دست آمده توسط دو گروه معاینه کننده (رزیدنت ها و اساتید) مورد تجزیه و تحلیل قرار گرفت.

**یافته ها:** تجزیه و تحلیل داده ها نشان داد که توافق بین اساتید و رزیدنت های زنان و زایمان برای اتساع دهانه رحم، نرم شدگی دهانه رحم و ایستگاه سر جنین به ترتیب ۰/۸۸، ۰/۹ و ۰/۶۷ ( $P < ۰/۰۰۱$ ) است. همبستگی بین اساتید و رزیدنت های زنان و زایمان برای تعیین اتساع دهانه رحم، نرم شدگی دهانه رحم و ایستگاه سر جنین به ترتیب ۰/۷۷، ۰/۷۹ و ۰/۵۲ بود ( $P < ۰/۰۰۱$ ).

**نتیجه گیری:** توافق و همبستگی اساتید و رزیدنت های زنان و زایمان در مورد تعیین جایگاه سر جنین کمتر از حد نسبت به اتساع و نرم شدگی دهانه رحم می باشد. با توجه به اهمیت تعیین دقیق جایگاه سر جنین در مرحله اول زایمان، باید از رویکردی جدید (وسيله جدید اختراع شده برای جایگاه سر جنین) جهت تعیین جایگاه سر جنین استفاده شود.

**واژه های کلیدی:** جایگاه سر جنین، زایمان، ماما، معاینه واژینال

**الخلفية و الهدف:** تحديد موضع رأس الجنين هو عامل مهم في تحديد تقدم المخاض. تبحث هذه الدراسة عن الاتفاق والعلاقة بين أساتذة التوليد والمساعدين في تحديد مركز رأس الجنين على أساس الفحص المهبلي أثناء الولادة. **الطريقة:** في هذه الدراسة المقطعية، تم فحص النساء الحوامل المصابات بحمل كامل ومظاهر رأسية في المرحلة النشطة من المخاض في وقت واحد من قبل المساعدين وأساتذة التوليد وأمراض النساء. تم تسجيل نتائج فحصهم على وضع رأس الجنين وتوسع عنق الرحم وتليينه من قبل الأساتذة ومساعديهم. تم تحليل البيانات باستخدام برنامج SPSS16 وباستخدام اختبار ارتباط Spearman ومعامل الارتباط Intraclass بين النتائج التي تم الحصول عليها من قبل مجموعتي الفحص (المقيمتين والأساتذة).

**النتائج:** أظهر تحليل البيانات أن التوافق بين أساتذة التوليد وأمراض النساء ومساعديهم لتوسيع عنق الرحم وتليين عنق الرحم وموضع رأس الجنين كانت ۰/۸۸، ۰/۹ و ۰/۶۷ على التوالي ( $P < 0.001$ ). كانت العلاقة بين الأساتذة والمقيمتين في مجال التوليد لتحديد توسع عنق الرحم وتليين عنق الرحم ومحة رأس الجنين ۰/۷۷ و ۰/۷۹ و ۰/۵۲ على التوالي ( $P < 0.001$ ).

**الخلاصة:** إن الاتفاق والارتباط بين أساتذة ومقيمتين أمراض النساء والتوليد على تحديد وضعية رأس الجنين أقل من اتساع عنق الرحم وتليينه. نظراً لأهمية التحديد الدقيق لموضع رأس الجنين في المرحلة الأولى من المخاض، يجب استخدام نهج جديد لتحديد موضع رأس الجنين (جهاز تم اختراعه حديثاً لذلك). **الكلمات المفتاحية:** وضعية رأس الجنين، الولادة، القبالة، الفحص المهبلي

### جنین کے سر کی پوزیشن کیا گائناکالوجی اینڈ آسٹریٹریس کی ماہر اساتذہ اور رزیدنٹس میں اتفاق ہو گیا ہے ؟

**بیک گراؤنڈ:** زچگی کے دوران جنین کے سر کی پوزیشن کا تعین نہایت اہمیت کا حامل ہے۔ اس تحقیق میں ویجائنل معائنے کے ذریعے زچگی کے دوران جنین کے سر کی پوزیشن کے بارے میں گائناکالوجی اینڈ آسٹریٹریس کی ماہر اساتذہ اور رزیدنٹ ڈاکٹروں میں اتفاق اور رابطے کا جائزہ لیا گیا ہے۔

**روش:** اس تحقیق میں زچگی کے سفالک مرحلے میں گائنا کالوجی اور آسٹریٹریس کے رزیدنٹس اور ماہر اساتذہ نے جنین کے سر کی پوزیشن کا معائنہ کیا۔ انہوں نے جنین کے سر کی پوزیشن اور سروکس کے پھیلاؤ کا جو معائنہ کیا تھا اسے نوٹ کیا۔ سا ڈیٹا کا تجزیہ ایس پی ایس سولہ اور اسپیرمین اور انٹرا کلاس ٹسٹ کے ذریعے کیا گیا۔

**نتیجے:** ڈیٹا کے تجزیے سے معلوم ہوتا ہے کہ گائناکالوجی اور آسٹریٹریس کی ماہر اساتذہ اور رزیدنٹس میں سروکس کے پھیلاؤ اور جنین کے سر کی پوزیشن کے بارے میں ان کا اتفاق ۸۸٪ اس طرح ۰/، ۰/۹ و ۰/۶۷ ( $P < ۰.۰۰۱$ ) ہے۔

**سفارش:** اس تحقیق سے معلوم ہوتا ہے کہ گائناکالوجی اینڈ آسٹریٹریس کی ماہر اساتذہ اور رزیدنٹس کے درمیان جنین کے سر کی پوزیشن کے بارے میں ان کا اتفاق سروکس کے پھیلاؤ کی نسبت کم تھا۔ زچگی کے دوران جنین کے سر کی پوزیشن کے تعین کی اہمیت کے پیش نظر نئی ایجاد شدہ روشوں سے استفادہ کیا جائے تاکہ غلطی کا امکان کم سے کم ہوتا جائے۔

**کلیدی الفاظ:** جنین کے سر کی پوزیشن، زچگی

## INTRODUCTION

A fetal head station is determined by comparing the position of occiput of fetal head with that of ischial spines. Precise identification of fetal head station during the second stage of labor is important since the fetus moves downward during labor. Fetal head station determines the feasibility of vaginal delivery or the need for assisted delivery or cesarean section (1). Evaluation is often carried out through vaginal examination to determine fetal head station with regard to ischial spines. When the occiput of the fetal head is in the level of ischial spines, the station is zero while when it is located below the level of ischial spines, higher station scores are assigned which signifies the entrance of fetal head into the cervix (2). The accurate vaginal examination is essential for the management of the delivery process (3,4). Sometimes the results of the evaluation of fetal head station might be inaccurate, especially in case of head molding or caput succedaneum, which lead to the inaccurate detection of the station (5). A research performed in France showed little agreement among evaluators (i.e., attending physicians and residents) for fetal head station which represented the low reliability of such assessments (6). This low level of reliability might be a reason for expertise to know that vaginal examination cannot be achieved through observation alone. Thus, more frequent examinations of pregnant women must be performed by medical students to gain sufficient experience in this area.

Further, the vaginal examination must be re-performed by an expert to ensure the accuracy of findings obtained by students (3). Repeated vaginal examinations of pregnant women may result in the entrance of bacteria into chorionic membranes and induction of chorioamnionitis as well (7,8). Moreover, multiple vaginal examinations can have adverse effects on fetal health. Repeated vaginal examinations ( $\geq 7$  times) increase the incidence of neonatal sepsis by four-five times, leading to prolonged infant hospitalization and increased risk of need for antibiotic treatments. With multiple vaginal examinations, the risk of developing group B streptococcal infections in newborns increases which necessitates prescription of antibiotics that may, in turn, result in the development of antibiotic resistance, as well as asthma and allergy (7). Other disadvantages of multiple vaginal examinations will increase maternal discomfort, pain, and anxiety during the examination (9). In this respect, a report from Egypt on pregnant women showed that 50.7% of mothers underwent 5-12 vaginal examinations during delivery at short intervals, and 73.3% of these examinations were performed by two to three healthcare professionals (8). The aim of this study was evaluating the agreement and correlation of fetal head station in simultaneous vaginal examinations between gynecologists and residents of gynecology.

## METHODS

This prospective cross-sectional study with ethical code of IR.MUMS.REC.1395.117 was approved by the Ethics Committee of Mashhad University of Medical Sciences, and it was conducted on pregnant women with term pregnancy

who admitted in the maternity ward of Om-Al-Banin hospital, (a teaching hospital affiliated to Mashhad University of Medical Sciences, Mashhad, Iran) in 2016 - 2017.

The exclusion criteria were having a history of a previous cesarean section and lack of willingness to participate in the present project. Written informed consents were obtained from the individuals before being enrolled in the study. The participants were chosen through consecutive sampling method, and demographic and maternal characteristics of all participants were recorded as well. Also, vaginal examinations (regarding cervical dilation, head position, the presence of molding, and fetal head station) were independently performed by two examiners (a resident and a professor of obstetrics and gynecology) and were separately recorded. The primary outcome of the study was to evaluate the agreement and the correlation between the examiners regarding dilation, effacement, and fetal head station in the vaginal examination. Therefore, each pregnant woman was first examined by a resident to determine fetal head station by using three section division systems. The limit of ischial spines was zero, and distances between the ischial spines and the pelvic inlet and outlet were divided by three equal sections. In this study, a three-section division was used with minus one, two, and three above the ischial spines and one, two, and three below the ischial spines. During vaginal examinations, using sterile gloves, the resident entered the vaginal canal with the middle and index fingers. After determining the cervical dilation and effacement, the index finger was placed on the occiput of the fetal head, and the middle finger was moved toward the pelvic wall to find the location of ischial spines. The location of the occiput of fetal head was determined relative to the ischial spines. Occiput at the level of ischial spines was indicative of fetal head station zero, whereas higher or lower placement of the ischial spines was presented as negative or positive values for fetal head station, respectively. The resident recorded the examination results including dilation, cervical effacement, and a fetal head station in the same checklist which was filled for maternal characteristics.

Before placing the mothers on a lateral recumbent position, participants underwent another vaginal examination performed by the professor who recorded the examination results on a different sheet. It is worth mentioning that the two evaluators (the professor and the resident) were blind to the examination results of each other. A total of three Residents and three professors (as a master) were present in this study. Residents being in their second or third year of education, were trained to do vaginal examinations in the same way at the beginning of the study. The agreement between them for vaginal examination was more than 85%. Masters were university professors or associate professors of obstetrics and gynecology, and the agreement between their views was more than 90%. Data analysis was carried out in SPSS version 16, using descriptive statistics (to evaluate the normal distribution of the data) and Spearman's correlation test (considering the ordinal nature of the variable, this test was used to assess the correlation between the opinions of the professors and residents about vaginal examinations). An intra-class correlation coefficient (ICC) was applied for

evaluation of agreements between the gynecologist and resident too. A P-value less than 0.05 was considered statistically significant.

**RESULTS**

Clinical characteristics of 218 mothers enrolling in this study are presented in Table 1. The majority of participants (i.e., 49.5 and 56%, respectively) had a dilation of 4-6 cm and an effacement of 40-60%. Also, the fetal head station was negative in most of the participants (77.5%). According to the results, there was a significant correlation between the professors and residents concerning dilation ( $r=0.77$ ,  $P<0.001$ ) and effacement ( $r=0.79$ ,  $P<0.001$ ). However, a moderate correlation was observed regarding a head station ( $r=0.52$ ,  $P<0.001$ ).

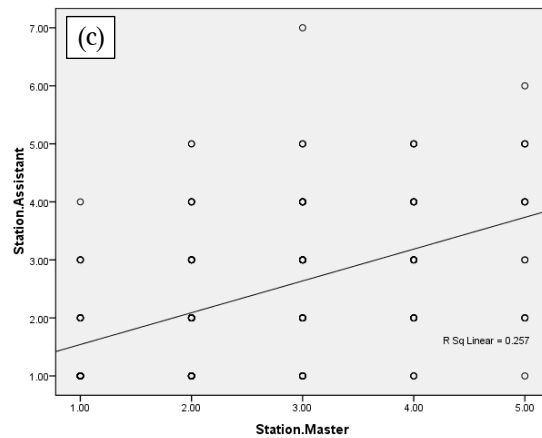
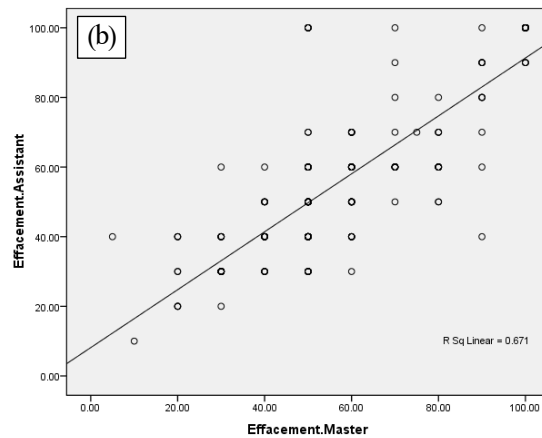
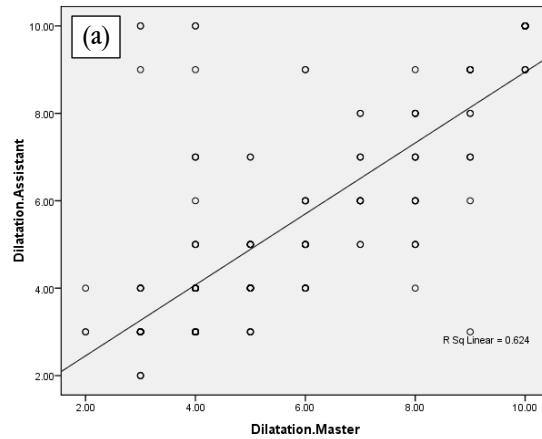
Table 1. A frequency of dilation, effacement, and a fetal head station in vaginal examination of participants			
Variables	Frequency	Percentage	
Dilatation (cm)	<4	36	16.5
	4-6	108	49.5
	7-9	47	21.6
	10	27	12.4
Effacement (%)	<40	31	14.2
	40-60	122	56
	70-90	39	17.9
	100	26	11.9
Station	-3	46	21.1
	-2	70	32.1
	-1	53	24.3
	0	31	14.2
	+1	18	8.3

Correlation between the professors' and residents' points of view regarding the assessed parameters is depicted in Figure 1. Moreover, an acceptable level of agreement was found for dilation ( $ICC=0.88$ ,  $P<0.001$ ) and effacement ( $ICC=0.9$ ,  $P<0.001$ ) between the gynecologist and residents. Nevertheless, this agreement was at a moderate level ( $ICC=0.67$ ,  $P<0.001$ ) for a fetal head station.

The frequency of disagreement in the determination of head station is exhibited in Figure 2. This shows that at the fetal head station -3, there was 60.3% disagreement between the residents and professors, while 100% disagreement was observed for the other fetal head stations.

**DISCUSSION**

The result of this study showed that the professors and residents had an acceptable level of agreement for diagnosis of dilation and effacement; however, they had a moderate level of agreement for fetal head station during active phase of labor. Accurate diagnosis of labor progress is crucial for pregnant women's care, and in case of misdiagnosis,



**Figure 1. Correlation between the professors and residents in obstetrics and gynecology concerning dilation (a), effacement (b), and station (c) determination**

unnecessary cesarean delivery is suggested. Vaginal examination during labor evaluates the progress of delivery and is considered as a part of routine care of pregnant women. The guidelines recommend that women should be regularly monitored at 4-hour intervals unless they require a vaginal examination (1), although in educational hospitals, the number of such examinations is more than Non-educational hospitals. In a study done by Maaita, et al. 50.7% of pregnant women were examined between 5-12 times

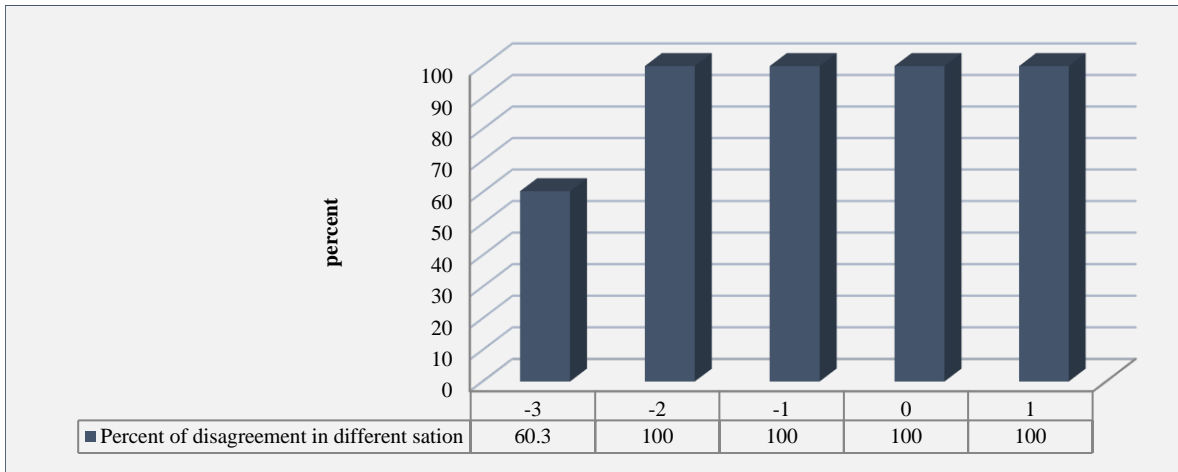


Figure 2. Disagreement between professors and residents in obstetrics and gynecology about determination of fetal head station

during labor and these women with multiple examinations during labor suffered from pain. (8). Vaginal examinations during labor are performed to determine the progress of labor by determining the degree of cervical dilation and fetal head station. Determination of the stage of labor and fetal descent which is crucial for prediction of labor as an elevated station of the fetal head in the first stage of labor, predicts a difficult delivery or need for cesarean delivery (3,4). In the present study, statistical analysis showed a good agreement between the professors and residents for determination of dilation and cervical lesions, but in case of station -3, an agreement of only 39.7% was found between the professors and residents. For other parameters, 100% disagreement was found between the two groups of examiners (i.e., professors and residents), as residents generally announced a lower position for the head of the fetus. Similarly, the majority of previous studies also indicated disagreements between examiners regarding gestational status. In a study done by Buchmann, et al. in 2008, it was found that only for 37% of fetal head station, determinations showed agreement between the researcher and clinicians, and there was a discrepancy between researcher and clinician (2). Consistently, in the present study, an agreement was only observed for 39.7% of the cases, and generally, residents assigned lower fetal head stations as compared to the professors. Considering disagreement among examiners in terms of position of the fetus, the importance of fetal positioning in determining the progression of labor findings of examinations by ultrasound or other devices was compared with those obtained by manual examinations (i.e. examinations done by using two fingers). In this regard, Dupuis, et al. in a study performed in a university hospital, used trans-abdominal ultrasound to determine the position of the fetal head in the second stage of labor, and compared it with manual examinations. The results of this study showed that in 70% of the cases, there was an agreement between the two methods used for determining the position of the fetal head. In the absence of consideration of 45

degrees of difference in the position of the fetal head, 80% agreement was found in the position of the fetal head. There was a significant difference between fetal head over 45 degrees, which was 50% in the case of posterior occiput. Therefore, it was concluded that a trans-abdominal ultrasound could accurately determine the position of the fetal head (6). In another study, Nizard, et al. concluded that ultrasound is beneficial as it can determine the fetal position (9). In another study conducted by Ghi in 2009, trans labial ultrasound was used to determine the fetal position and rotation in the second stage of labor; In this study, application of trans-lumbar ultrasound resulted in correct determination of the fetal head in comparison to manual examinations, and the information obtained would determine the probable requirement of tools for childbirth (10). In general, acquisition of vaginal examination skills requires teaching and training, which should be done using simulations before performing on actual patients. Arias, et al. randomly divided 66 medical students into two groups. The first group performed ten times vaginal examination on the simulator by the help of the professor. They then performed a real examination on the patient, but the second group examined the vaginal examination, but they did examine the real patient. Both groups reported a correct cervical length, position, cervical dilatation, degree of dilation, and fetal station after the examination. The results of this study showed that the accuracy of vaginal examination in the group that had been practiced by the simulator was significantly higher than another group (3). In another study, Awan, et al. designed a device to determine the position of the fetal head and compared the results obtained by the device with vaginal examination about the position of the fetal head. The results of the study showed that the device designed for a more detailed vaginal examination revealed the location of the fetal head and was found useful in determining head steady (1). In another study, Dr. Akhlaghi et al. compared diagnostic agreement on head station determination between a new invented device station meter and vaginal examination. Due

to the significant difference between the station of the fetal head determinate by vaginal examination of the senior resident and new invented device station meter, they concluded that the station meter can be used with high reliability, high correlation, and agreement to determine the station of the fetal head. So it can be used to teach skills determining the fetal head station to midwifery, medical students, and obstetrics & gynecology residents (11). The limitation of this study was using no blinding and more accurate results were obtained if blinding was performed. The results of this study which showed disagreement between professors and residents in obstetrics and gynecology concerning the determination of fetal head station led to making inaccurate decisions for the method of delivery. Therefore, novel approaches for accurate determination of station and descent of the fetal head are crucially required to have a more accurate insight into the labor progress, so that the optimum method of delivery may be chosen.

### Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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**Conflict of interest:** Authors declare no conflict of interest.

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