

ORIGINAL ARTICLE

The value of vaginal wash urea and creatinine concentration for diagnosis of premature rupture of membranes

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ABSTRACT

Keywords: prelabour rupture of membranes, preterm labor, vaginal urea and creatinine, amniotic fluid.

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Background: Prelabour rupture of fetal membranes (PROM) refers to fetal membrane rupture before the onset of uterine contractions; preterm PROM (PPROM) is the term used when the pregnancy is less than 37 completed weeks of gestation. **Purpose:** This study aims to assess the accuracy of vaginal fluid urea and creatinine for the diagnosis of premature rupture of membranes and preterm premature rupture of membranes. **Patients and Methods:** A total of 90 pregnant women were included in the current study, between completed 28 weeks to completed 40 weeks of gestation, divided into two equal groups: 45 pregnant women with PPRM or PROM diagnosed by pooling of fluid in posterior fornix and 45 pregnant women who are attending the outpatient clinic for routine antenatal care, each group had the posterior vaginal fornix irrigated with 5ml saline and aspirated then assessed for urea and creatinine concentration. **Results:** This study showed that the confirmed PPRM and PROM group had higher levels of vaginal fluid urea and creatinine compared to the control group with a very highly statistically significant difference between the groups. **Conclusion:** vaginal fluid urea and creatinine determination for the diagnosis of PPRM and PROM is a rapid, simple, and non-invasive method and had higher sensitivity and specificity to establish an accurate diagnosis.

INTRODUCTION

Preterm PROM (PPROM) is the term used when the pregnancy is less than 37 completed weeks gestational age. Prelabour rupture of foetal membranes (PROM) refers to foetal membrane rupture before to the commencement of uterine contractions. (1).

The procedures used to diagnose PROM vary and are largely dependent on clinical examination as opposed to biological testing, which are helpful when dealing with patients who are clinically asymptomatic or whose PROM is ambiguous (2).

Considering that foetal urine is the primary source of liquor in the second half of pregnancy, vaginal urea and creatinine may be useful in the diagnosis of PROM(3).

MATERIALS AND METHODS

This study was conducted at the obstetrics and gynecology department – at Aswan university hospitals.

In the current study, 90 pregnant women with completed gestations between 28 and 40 weeks were allocated equally into two groups: 45 pregnant women with PPRM or PROM and 45 women who are attending outpatient clinic for routine antenatal care.

After explaining the method to the patients and giving informed consent, all women were subjected to full history, general examination, abdominal examination, C.T.G., laboratory investigations, and ultrasonic assessment of amniotic fluid index, they were then placed in the lithotomy position, the fluid leak was observed using a sterile Cusco speculum, and the results were noted as positive or negative. To assess the PH of the vaginal fluid, a swab was placed in the posterior fornix and quickly transferred to nitrazine paper. Patients were classified to be in the confirmed PPRM or PROM group if they had both positive pooling and positive nitrazine paper tests (group I) On the other side, The control group (groupII) consisted of pregnant women who had no complaints or complications, with negative results on the nitrazine paper test and pooling tests. Thereafter 5ml of saline was pooled into the posterior fornix and at least 3ml of the irrigated saline was collected with same syringe and a sample was sent immediately to the laboratory at Aswan university hospital for assay of urea and creatinine.

The parameters (maternal age, gestational age, parity and AFI at the time of admission, vaginal fluid urea, and creatinine) were also documented.

Statistical analysis of the data:

IBM SPSS Statistics version 20 (IBM Corp., Armonk, NY, USA) was used to analyse the data. (4) The Shapiro-Wilk test was used to check the normality of the distribution of numerical data. The independent samples t-test was used to assess inter-group differences between normally distributed numerical variables that were provided as mean \pm SD. Ordinal variables were represented as numbers (%), and the chi-squared and fisher exact tests for trend were used to compare intergroup differences. In order to investigate the diagnostic utility of the AFI, urea, or creatinine for differentiation between patients with PROM and controls, Receiver-operating characteristic (ROC) curve analysis was utilized. Pearson For certain of the study's parameters, correlation values (r) were also projected. P-values lower than 0.05 were considered as statistically significant.

RESULTS

In this study, there was no statistically significant relation between vaginal fluid urea and creatinine concentration versus maternal age, parity, and gestational age. It was observed that there were very highly statistically significant positive correlations between vaginal fluid urea and creatinine versus amniotic pooling by Cusco speculum examination. Also, there were very highly statistically significant inverse correlations between vaginal fluid urea and creatinine levels versus amniotic fluid index (AFI) , this means that when AFI at the time of obtaining the sample decreased, vaginal fluid urea and creatinine levels will increase and vice versa is true. This study showed the mean vaginal fluid urea levels in the definite PPRM and PROM and the control groups using unpaired t-test as next, 19.72 ± 5.58 mg/dl, and 2.38 ± 1.19 mg/dl, respectively, where difference was highly significant (p-value < 0.001). With a cut-off value of > 5.5 mg/dl, the sensitivity, specificity, positive predictivity, and negative predictivity were each 97.8%, 95.6%, 95.7%, and 97.7%, respectively

The current study showed the mean vaginal fluid creatinine levels in definite PPRM and PROM and control groups using unpaired t-test as next, 1.19 ± 0.33 mg/dl, and 0.099 ± 0.05 mg/dl, respectively, where difference was highly significant (p-value < 0.001). With a cut-off value of $>$

0.25 mg/ dl, the sensitivity, specificity, positive predictivity, and negative predictivity were each 93.3%, 91.1%, 91.3%, and 92.2%, respectively.

This study demonstrated a highly statistically significant difference between the groups, with the confirmed PPROM and PROM group having greater levels of vaginal fluid urea and creatinine than the control group.

Table (1): Demographic data of study groups

Variable	PROM (n=45)	Non-PROM (n=45)	p-value
Age: Mean ± SD	29.11± 6.20	30.00± 6.38	0.507
BMI (kg/m2): Mean ± SD	24.53 ± 5.56	25.67 ± 6.12	0.312
Parity			0.422
• Primigravida	13	10	
• multipara	32	35	
Gestational age Mean ± SD	32.47± 4.35	30.91 ± 3.33	0.061

Table (2): performance of vaginal wash urea and performance of vaginal wash creatinine concentrations in the prediction of PROM among study cases

	Cutoff	AUC	95% CI	Sensitivity	Specificity	PPV	NPV	Accuracy	P-value
Urea	5.5 mg/dl	0.99	0.97 to 1.00	97.8	95.6	95.7	97.7	96.7	< 0.001
Creatinine	0.25 mg/dl	0.93	0.858 to 1.00	93.3	91.1	91.3	93.2	92.2	< 0.001
Combined	=====	0.94	0.889 to 0.999	100.0	88.9	90.0	100	94.4	< 0.001

AUC: area under the curve
 CI: confidence interval

PPV: positive predictive value
 NPV: negative predictive value

DISCUSSION

An inappropriate intervention, such as hospitalization or labour induction, may result from a faulty diagnosis of membrane rupture. Therefore, it is highly preferred to quickly confirm a diagnosis of membrane rupture in uncertain cases.

(5). This study showed that there was no significant difference between the two groups as regards the maternal age, 29.11± 6.20 and 30.00± 6.38 respectively, or gestational age, 32.47± 4.35 and 30.91 ± 3.33 respectively (p-value>0.05) and also regarding the parity (p-value>0.05). This agrees with the research conducted by Urdaneta et al. (6) who stated that there were no statistically significant differences between the analysed groups in the mean gestational ages of the diagnosed PROM group and control group, which were 32.9±1.6 and 33.1±1.9, respectively. With regard to AFI, there was a very statistically significant difference between the described groups (p-value <0.001); the confirmed group's AFI was lower than that of the control group's. These outcomes are in line with the research done by Erdemoglu and Mungan. (7). who found that the AFI of the confirmed PROM group was significantly lower than that of the unconfirmed PROM group.

The purpose of this study is to evaluate how well urea and creatinine in vaginal fluid can diagnose preterm premature rupture of membranes and premature rupture of membranes.

This study showed mean vaginal fluid urea levels in the definite PPROM and PROM and the control groups using unpaired t-test as next, 19.72±5.58mg/dl, and 2.38±1.19mg/dl, respectively, where the difference was highly statistically significant (p-value <0.001). The sensitivity, specificity, positive predictivity, and negative predictivity were 97.8%, 95.6%, 95.7 %, and 97.7% respectively, with cut off value of >5.5 mg/ dl. These results similar with the study by David et al (8), who reported that the difference between the mean vaginal fluid urea levels in the confirmed

PROM group and control group was statistically significant (p-value 0.05), being 27.6 6.2 mg/dl and 1.1 2.7 mg/dl, respectively. having a cutoff value of 9.6 mg/dl with sensitivity, specificity, .positive predictivity, and negative predictivity of 83%, 97.3%, 96.5%, and 85.6%, respectively. The current study showed the mean vaginal fluid creatinine levels in definite PPRM and PROM and control groups using unpaired t-test as next, 1.19 ± 0.33 mg/dl, and 0.099 ± 0.05 mg/dl, respectively, which is highly statistically significant different (p-value <0.001). The sensitivity, specificity, positive predictivity, and negative predictivity were 93.3%, 91.1%, 91.3%, and 92.2% respectively, with a cut-off value of > 0.25 mg/ dl. These results similar to the results of a study by Zanjani and Haghighil. (9), who reported that the mean vaginal fluid creatinine levels in the confirmed group and suspected group, and control group were 1.74 ± 0.8 mg/dl, 0.45 ± 0.2 and 0.25 ± 0.1 mg/dl respectively, this is highly statistically significant different (p-value <0.001) with sensitivity, specificity, positive predictivity, and negative predictivity were 96.7%, 100%, 100%, and 96.8% respectively, and a cut off value of 0.5 mg/dl these results in the line with the results reported by Taviana et al(10) who reported that mean vaginal fluid creatinine concentration of confirmed group, suspected group and control group were 0.22 ± 0.08 , 0.55 ± 0.04 and 0.07 ± 0.02 mg/dl respectively with The sensitivity, specificity, and positive and negative predictive values were 90.2%, 91.2%, 83.6%, and 90% respectively, in detecting PROM by evaluation of vaginal fluid creatinine concentration with a cut off value of 0.75 mg/dl.

CONCLUSION This study came to the conclusion that the identification of PPRM and PROM using vaginal fluid urea and creatinine determination is a quick, easy, and non-invasive method with higher sensitivity and specificity to establish an accurate diagnosis. It has the potential to develop into the gold standard diagnostic method for PPRM and PROM.

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