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Predisposing factors of unresolved gestational hydronephrosis among pregnant women

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ABSTRACT

Background. Gestational hydronephrosis is due to compression of upper urinary tracts resulting from uterine enlargement. Recognition of the predisposing factors would help to reduce the burden of the issue.

Objective. In this study, the various factors of maternal hydronephrosis among pregnant women were assessed.

Materials and Methods. In this prospective cohort, 105 consecutive pregnant women were assessed in an 18-month period of time for occurrence and severity of hydronephrosis and contributing factors were determined.

Results. In this study, 83.8% had gestational hydronephrosis that was alleviated in 76.1% in postpartum phase. Myoma, gestational diabetes mellitus, and twin pregnancies were related to both more occurrence and less improvement of hydronephrosis; however, high gravid was only related to less improvement of gestational hydronephrosis ($p < 0.05$).

Conclusions. Approximately, 4/5 of pregnant women experience gestational hydronephrosis that is alleviated in 3/4 of the cases in the postpartum phase. It is multifactorial and in high-risk women such as those with high gravid, twin pregnancy, gestational diabetes mellitus, and myoma, further screenings and cautions are required.

INTRODUCTION

Gestational hydronephrosis is an aggravated physiological phenomenon that often occurred in pregnancy from 6th to 10th weeks, and is usually due to compression of the upper urinary tracts by an enlarged uterine [1, 2]. It is more common in the right kidney of pregnant women. Although, gestational hydronephrosis is usually asymptomatic, it may be bothersome in some high-risk preg-

nant women. The symptoms of this phenomenon vary from mild flank pain to severe [3, 4]. Also, there is an increased risk of kidney scar in patients without improvement [5]. It may be asymptomatic or with flank, abdominal, or inguinal pain [6, 7]. Dysuria, urinary retention, and incontinence are less common symptoms, as well as, fever, nausea, vomiting, and hematuria, depending on the cause and severity of urinary obstruction [7, 8]. Multiple causes are proposed for gestational hydrone-

phrosis but enlarged uterine and pressure on the ureters may reduce the urinary flow that may be also aggravated by organ prolapse and increased progesterone secretion and muscle relaxation, totally leading to urinary retention with mild, moderate, and severe grades [9, 10]. Treatment of the main underlying cause is crucial, however, if only the pregnancy is contributing factor, no further interventions are required, and it would be resolved spontaneously after pregnancy termination. But drainage of retained urine by catheters would decrease the injury [11, 12]. Determination of the contributing factors would be useful for the prevention of hydronephrosis and consequent problems [13-20]. Hence, in this study, the predisposing factors of gestational hydronephrosis were assessed.

MATERIALS AND METHODS

In this prospective cohort, 105 consecutive pregnant women attending the hospitals with which the authors are affiliated, in 2018 and 2019, were enrolled. The exclusion criteria were history of renal disease, stone, urinary infection and hydronephrosis. Data were collected by checklists with interview and observation. Moreover, the hydronephrosis and severity were assessed by ultrasound across the study by a single expert radiologist.

The study was approved by the ethical committee of the authors' institution with Code IR.IUMS. Rec1396.8923496033. The patients signed informed consent for participating in the study. The study was performed in accordance with the ethical standards described in an appropriate version of the 1964 Declaration of Helsinki, as revised in 2013. No additional costs were imposed on the patients. Ultrasonography was carried out in each trimester to determine the ureter length and diameters. Additionally, six weeks after labour, it was repeated to monitor the resolution of hydronephrosis. In unresolved cases, serial ultrasound assessments were done.

Statistical analysis

Data analysis was done by SPSS version 22.0 software. The utilized tests were Independent-Sample-T, Mann-Whitney, Chi-Square, Fisher, Spearman, and Pearson. The P values less than 0.05 was considered significant.

RESULTS

Totally 105 women were assessed. The mean age was 31 ± 5 ranging from 19 to 42 years. Ultrasonography was carried out in the second and third trimester to evaluate the ureteral length and diameters. Moreover, six weeks after labour, follow up sonography was done to monitor the resolution of hydronephrosis. In unresolved cases, serial ultrasound evaluations were performed. Totally, 88 women developed gestational hydronephrosis (83.8%).

In the second trimester assessment, 39 women were normal; however, 29, 10, and 27 women had right, left, and bilateral hydronephrosis, respectively.

In the third trimester, 17 pregnant women were normal, though, 29, 4, and 55 had right, left, and bilateral hydronephrosis, respectively. Among 88 cases with gestational hydronephrosis in the third trimester, 67 patients were completely resolved after labour; anyhow, it was remained in right, left, and both sides in 12, 6, and 3 cases (Figure 1).

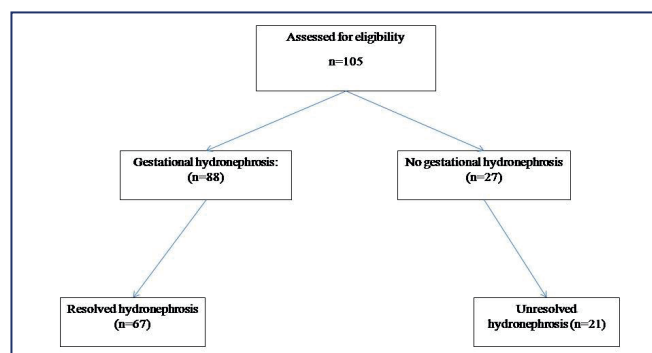


Figure 1. Flow chart of the study.

After multivariate analysis, the primigravidity was related to unresolved maternal hydronephrosis ($p = 0.001$), however, the parity was not related ($p > 0.05$). In mothers with myoma, the hydronephrosis was related to myoma and right-side APD was significantly higher in the third trimester ($p = 0.004$). All myoma cases had no resolution in hydronephrosis on the right side ($p = 0.0001$).

In the postpartum phase, there was a significant association between gestational diabetes mellitus (GDM) and unresolved right-side hydronephrosis ($p = 0.036$), however, it was not related to unresolved left side hydronephrosis ($p = 0.07$).

Gestational hypertension was only seen in four mothers and comparison may not be comprehensive.

The mean amniotic fluid index (AFI) was 142.2 ± 23.8 and 135.1 ± 34.4 in the second and third trimesters, respectively. The mean AFI was not different in unresolved and resolved cases ($p = 0.024$). Mean fetal weight was 746.5 ± 176.8 and 2850.7 ± 363.8 in the second and third trimesters, respectively. In the second trimester, APD was related to fetal weight in second trimester ($p = 0.013$). The fetal weight was not significantly different between the unresolved and resolved group ($p = 0.15$).

The maternal weight in third trimester on the left side had a significant association with severe hydronephrosis ($p = 0.027$) and in both sides in third trimester was significantly higher ($p < 0.05$), though it was not related to unresolved hydronephrosis.

There were 5 women with twin pregnancy that all had hydronephrosis that had increased severity in all cases in the third trimester; however, surprisingly, all were resolved in the postpartum phase.

DISCUSSION

In this study, the severity and prevalence of gestational hydronephrosis were assessed and nearly 84% had hydronephrosis that was alleviated in 76.1% in the post-partum phase. Primigravity, myoma, GDM, fetal and maternal weight and also twin pregnancy is related to increased gestational hydronephrosis incidence. However, only Primigravidity, myoma and GDM were related to unresolved maternal hydronephrosis. Schulman and Herlinger reported that hydronephrosis was seen since mid-term to full-term pregnancy, but it was rare before mid-term. Also, 75% had right-side and 33.3% had left side hydronephrosis. It was right and left-sided in 10% and 86%, respectively. They concluded that hydronephrosis was not related to fetal position, gravidity, and urinary tract infection. The study by Rajaei *et al.* [3] among 59 cases showed that nearly 70% had unilateral or bilateral hydronephrosis. They found no significant association between gestational age and fetal presentation. But they reported higher rates in the first pregnancy and on the right side. However, in current assessments, the gravidity was related to hydronephrosis, and it was less significant in women without previous pregnancy.

The study by Fried *et al.* [10] among 20 asymptomatic women showed that 41.5% had hydronephrosis and dilatation and it was more common on the right side and was improved till six weeks after labour. In our study, the rate was higher (84%) and was dis-

appeared in the majority of cases (76%). However, the remaining cases had also lower intensity. But as shown by Babu *et al* [13] the prognosis would be better in unilateral cases [13]. Sarhan *et al.* reported a rate of 70% for spontaneous improvement of gestational hydronephrosis. It was relatively higher in our study. Oyinloye and Okoyomo [2] assessed 135 pregnant and 43 non-pregnant women by ultrasound for hydronephrosis and among them, 93.4% and 84.4% had right-side and left-side hydronephrosis. The mean ureteral diameter was significantly higher in them in comparison with non-pregnant cases without urinary disorders and hydronephrosis with a significant difference for the right side. In our study, the prevalence of hydronephrosis was higher and with more severity in comparison with the left side. Macedo *et al.* [21] have evaluated different diagnosis with potentially changed renal function such as Preeclampsia. In their meta-analysis, they found that socioeconomic variables have a great role in the risk of preeclampsia. Laganà *et al.* [22] have studied on the biochemical pattern in serum to predict preeclampsia and reviewed the available information about early markers [23].

Some authors such as Buttice *et al* discuss other etiology of gestational hydronephrosis, such as pelvic ureteral endometriosis and ureteral stones [24] which should be considered in unresolved cases of the disease. Woo *et al.* [6] assessed 56 asymptomatic pregnant women and found that 89% had minimal ureteral dilatation and it was severe in six cases. The dilatation was seen in all of them in the second trimester and usually the return in the first five weeks is not common. The medium to severe dilatation is low in women with mild dilatation in second trimester. Similarly, in our study, there was no significant association between hydronephrosis in second and third trimesters.

Totally, it is concluded that nearly 84% of pregnant women have gestational hydronephrosis and some altering factors such as myoma, gestational diabetes mellitus, and weight increase may raise the possibility of gestational hydronephrosis and less improvement. Hence programming for these factors would be beneficial. But also, there are some non-changeable factors such as twin pregnancy, gravidity, and parity that would necessitate further cares. In this study, all twin mothers had severe hydronephrosis in the last pregnancy month that was usually bilateral and regarding a low number of these mothers, the association with other factors was not determined. Also, the role of sex may be masked due to the interaction effects of other variables. However, further

studies with a larger sample size are required to develop more definite results and finding other predisposing factors, especially in twin pregnancies.

CONCLUSIONS

Approximately 4/5 of pregnant women experience gestational hydronephrosis that is alleviated in 3/4 of cases in the postpartum phase. It is multifactorial and in high-risk women such as those with primigravidity, gestational diabetes mellitus, and myoma, further screenings and cautions are required for unresolved hydronephrosis.

COMPLIANCE WITH ETHICAL STANDARDS

Authors contributions

M.A.G.: concept, design. E.K, A.S.: data collection or processing. M.R., A.S.: analysis or interpretation. M.R., A.S.: literature search. M.A.G., E.K., A.S.: drafting the work. All authors: final approval of the version to be published. All authors: agreement to be accountable for all aspects of the work.

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Discolsure of interests

The authors declare that they have no conflict of interests.

Ethical approval

The study was approved by ethical committee in Iran University of Medical Sciences with the code: IR.IUMS.Rec1396.8923496033.

Informed consent

The patients signed informed consent for participating in the study.

Data sharing

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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