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SHORT REPORT

Nutritional intervention in a hemodialysis pregnant woman: a case report

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Abstract—Pregnancy in dialysis patients is a rare occurrence. When pregnancy does occur, the risk of spontaneous abortion, stillbirth and neonatal complications, such as prematurity and growth retardation, are fairly high. The authors describe their experience in the follow-up of a patient with chronic renal failure who became pregnant during regular dialysis treatment and followed nutritional care. The outcomes were successful and she gave birth to a healthy baby. It is emphasized that special dedication to the nutritional control enabled a good outcome of the pregnancy. The importance of the nutritionist intervention in the follow-up of dialysis patients with the integration of a multidisciplinary staff is stressed.

Key words: hemodialysis; pregnancy; nutrition

Introduction

Pregnancy in dialyzed women is uncommon because of the high incidence of maternal–fetal complications. In healthy women, gestation is associated with a physiological increase in fat-free mass (FFM), fat mass (FM), total body water (TBW) and extracellular fluid space with an expansion of plasma volume (1). Owing to the intermittent nature of hemodialysis (HD) treatment, patient weight may oscillate between a 'wet' saline-overload state, just before the dialysis session, and a 'dry' state, just after it. In the course of HD session, due to the ultrafiltration process, plasma volume is reduced to a low point. Therefore, the recognition of both optimal 'dry weight' (DW) and DW change is a crucial point during pregnancy in HD patients.

In the last 15 years, bioelectrical impedance analysis (BIA) has been proposed as a non-invasive and rapid bedside method to evaluate fluid status in normal individuals and in diverse pathological conditions (2).

Recent evidences have highlighted an association between poor fetal outcome and maternal general conditions in dialyzed women, showing the possibility of an improvement in maternal–fetal well-being by an adequate maternal nutrition (3).

We present a case report of a woman with chronic renal failure who conceived just after starting regular dialysis treatment (RDT). The nutritional approach in the management of this patient obtained a positive outcome demonstrating the primary need of a multidisciplinary staff integration.

Case report

The patient was aged 22 years; she had a 6-year history of chronic renal failure secondary to renal hypoplasia and has been compliant to a protein-restricted diet for 5 years. Last year, the patient started HD treatment (3 sessions/week). At the end of the 2nd month of HD treatment, an on-going pregnancy at the 8th week was diagnosed. The patient was pregnant for the second time; in the first gestation, that occurred at the age of 19 years, at the end of the 5th month, she attained an abortion due to a severe placental insufficiency with early on-set of pregnancy-induced hypertension (pre-eclampsia).

Well informed about maternal–fetal risk, she was resolutely convinced to carry on the pregnancy. The frequency of dialysis sessions was then increased to 4/week and the patient was referred to our nutritional unit. At our first observation, at the end of the 3rd month of pregnancy, her body weight was 52.3 kg and body mass index (BMI, kg/m^2) was 22.

The body composition measures were calculated from BIA using the software provided by the BIA machine (model BIA 101 RJL, Akern, Firenze, Italy) (4). This predictive model (conventional BIA) allows us to calculate TBW, body FM, FFM and extracellular water (ECW); these values are reported in Table 1.

Table 1 Individual, anthropometric, BIA and biochemical data in a hemodialyzed pregnant woman at the end of the 3rd and at the beginning of the 5th, 7th and 9th months of pregnancy

	3rd month	5th month	7th month	9th month
Peso (kg)	52.3	58.5	62.0	64.0
BMI (kg/m^2)	22	25	27	28
TBW (lt)	27.6	28.7	29.6	30.5
ECW (%)	39.9	44.1	45.7	45.5
FFM (kg)	37.6	39.2	40.4	41.6
FM (kg)	14.7	19.3	21.6	22.4
BUN (mg/dl)	55.0	60.0	74.0	78.0
Creatinine (mg/dl)	5.2	5.2	5.8	5.6
Albumin (g/dl)	3.6	3.0	2.8	3.0
Hemoglobin (g/dl)	11.2	9.0	9.7	11
Calcium (mg/dl)	8.2	8.0	10.1	9.1
Phosphorus (mg/dl)	4.9	4.2	4.5	4.5
Potassium (mEq/dl)	4.2	4.3	4.3	3.6

Legend: BMI = body mass index; TBW = total body weight; ECW = extracellular water as % of body weight; FFM = fat-free mass; FM = fat mass; BUN = blood urea nitrogen.

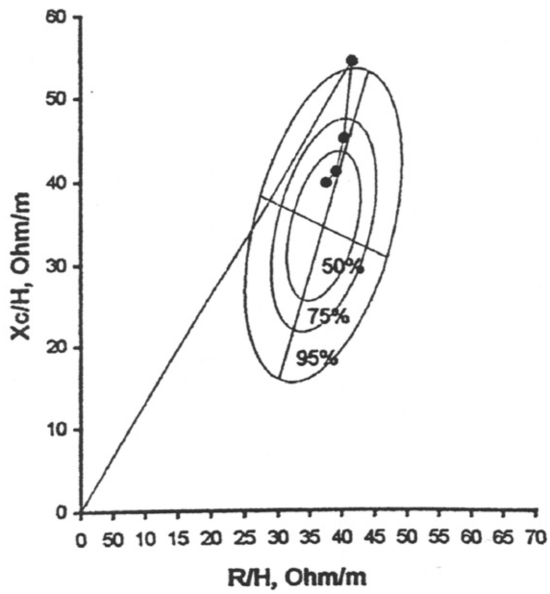

Fig. 1 RX_c mean graph of a hemodialyzed pregnant woman. The vector was measured at the beginning of the 3rd, 5th, 7th and 9th months of pregnancy. The longest vector was measured at the first control. Identification of progressive increase of DW was monitored by the impedance vector displacement from out of the upper pole of the 95% tolerance ellipse on the definite reference 75% tolerance ellipse.

During the whole pregnancy, fluid status was better monitored also using the Bioelectrical Impedance Vector Analysis (BIVA) method (2); we normalized R and X_c measurements by the stature of patient and plotted the vector as point on the gender-specific 50th, 75th and 95th tolerance ellipses calculated from the reference healthy population (2). At the first observation, the patient showed a severe underhydration (Fig. 1) and we suggested, as optimal, a ‘dry weight’ >2 kg. Repeated BIVA evaluations allowed us to maintain the patient in a normohydration status (Fig. 1) with absence of intradialytic symptoms (hypotension and cramps) and normal blood pressure values during the interdialytic period without any antihypertensive therapy.

In Table 1 are also reported anthropometric, and biochemical values obtained at the end of the 3rd month and at the beginning of the 5th, 7th and 9th months of pregnancy. K_t/V values, evaluated by Daugirdas method (5), were kept >1.3 during the whole pregnancy. Physiological changes in body composition, like increased fat, lean tissue and water content (Table 1) were observed during this pregnancy, as reported in healthy pregnant women. The progressive decrease in albumin and calcium plasma levels during the first and second trimesters of pregnancy, induced us to increase the protein intake (Table 2); these parameters showed a rise at the end of pregnancy.

Table 2 depicts dietary assessment and dietary intervention at the first observation (3rd month) and, subsequently, at the beginning of the 5th, 7th and 9th month of pregnancy. An interviewer-administered diet history was used to investigate the dietary intake. All data were calculated by using the software provided by Medimatica (Winfood). Energy and protein requirements were prescribed assuming a combined caloric intake of 35 kcal/kg b.w. with additional 300–400 kcal/diet necessary for pregnancy, and a protein intake of 1.2 g/kg b.w. with additional 6 g/diet of protein, recommended for fetal growth (according to recommended dietary allowance (RDA)). A small amount of daily protein intake (20 g) was administered as supplement of protein at low phosphorus content. The patient was relatively compliant to the assigned diet (Table 2). At the end of pregnancy, her body weight gain was 12 kg, according to RDA.

Table 2 Comparison of dietary energy–protein assigned and dietary energy–protein intake estimated by an interviewer-administered diet history in a hemodialyzed pregnant woman at the end of the 3rd and at the beginning of the 5th, 7th and 9th month of pregnancy

	3rd month	5th month	7th month	9th month
Energy assigned (kcal/kg)	41	42	43	43
Energy intake (kcal/kg)	43*	46	50	46
Protein assigned (g/kg)	1.6	1.9	2.1	2.1
Protein intake (g/kg)	1.3*	1.7	2.3	2.2

*Before dietary intervention.

Obstetrical care recorded a quite good course of the pregnancy. The patient achieved the end of the 36th week of pregnancy when, owing to rhythmic uterine contractions, a Caesarean section was performed; a 2090 live female was born and transfered into an incubator. The newborn did not show respiratory distress and showed a good recovery.

Discussion

In RDT women, conception rate is very low, ranging from 0.9% (6) to 7% (7), while the incidence of maternal–fetal complications is fairly high. Hypertension is the most common life-threatening problem in these women (8); hypertensive disorders are reported to complicate 49–100% of pregnancies in dialysis patients (9).

In pregnancies occurring during RDT, lower creatinine and blood urea nitrogen (BUN) levels may induce a better fetal well-being (3, 8). It has been recommended that an increase of dialysis time (10), both minimizing interdialytic weight gain and fetal exposure to higher levels of BUN or other waste products, may improve pregnancy outcome.

If adjustment in dialysis time and modality may be required for maintaining an adequate plasma level of biochemical parameters, a nutritional intervention is mandatory to provide an adequate protein and caloric intake; therefore, fetal well-being and mother safety depend on the close cooperation among all the specialists involved, including also a nutritionist.

In our patient, an adequate protein intake, was followed by a plasma albumin concentration behavior that resembles that of healthy women (Table 1). Calcium changes, with a decline in maternal serum total calcium concentration (Table 1), could reflect the changes in the non-ionized albumin-bound fraction (11). A protein intake supplementation with a low phosphorus content was crucial in maintaining the optimal phosphorus plasma levels. The patient was maintained at 2000 kcal/day and her total gain in body weight, at the end of pregnancy, coincided with the conventional standard of 12.5 kg.

Early works have demonstrated that a high intake of protein (>1.5 g/kg) associated with higher dose of HD, achieved by longer and/or every day dialysis sessions, may be the optimal approach to pregnant patients on HD (3, 10, 12). This protein intake with a balanced diet supports both the fetal growth and the maternal body modifications associated with pregnancy like the physiological increase of fat, lean tissue and water content.

In order to better control the physiological increase in TBW, as in normal pregnancy (13), we used BIVA method, as simple mean, to maintain a DW prescription (vector fell into the 75% reference ellipse), and an adequate body hydration that is considered the key element of fluid management in pregnancy course. Many definitions of DW are based on the presence or absence of symptoms of hypo- or hypervolemia (14). But these clinical criteria may compromise the placental blood flow emphasizing the importance of a different indication of volume status. It is important to underline that some obstetrical complications, such as placenta accreta (15) and increased resistance index of the umbilical artery (16), could be related to maternal hypovolemia. On the other hand, hypervolemia may also cause hemodynamic changes, such as vascular resistances increase and hypertension that are dangerous for both mother and fetus (17). The main goal in controlling DW is to achieve a good blood pressure control. Considering that hypertension, including malignant hypertension, has been reported to complicate 49–100% of pregnancies of women on dialysis, the remarkable importance of achieving a blood pressure control in these cases is easily understandable.

In conclusion, the pregnancy was successfully managed through to the 36th week and we suggest that special attention must be devoted to accurate nutritional and hydration status assessment and to some modifications in regular dialysis schedule, as crucial condition for a better outcome of pregnancy. This may be obtained through cooperation of a multidisciplinary staff that has to include the nutritionist's competence.

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