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Research Article

"Impact of Hypertensive Disorders of Pregnancy on Newborn Health Outcomes in Gaza Strip - Palestine: A comparative Study"

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ABSTRACT

Aim: to identify the possible adverse effect of hypertensive disorders of pregnancy on newborn outcome in Gaza strip – Palestine.

Methods: A comparative analytical design was performed. Two groups of 215 hypertensive and another 215 normotensive mothers in the last pregnancy were recruited from primary health care centers in Gaza strip after 3-stage stratified random sampling technique. A detailed questionnaire filled through face to face structured interviews in addition to medical records revision in 2017. Chi-square and t-test were used to compare the outcomes between the two groups.

Findings: 27.8% of hypertensive pregnant women had preexisting hypertension (n = 62) while the others developed pregnancy-induced hypertension (n = 153, 71.2%). About 23.7% had gravida ≥ 7; 54.6% were obese (BMI > 30) and 21.9% had a history of twice or more abortions. Only 20% of hypertensive women received preconception care. The most significant adverse outcomes of newborns delivered for hypertensive mothers were preterm birth (15.4%, p=0.013), low birth weight (10%, p=0.003) and neonatal admissions to hospitals (12.5%, p=0.044), while no significant differences were found in incidence of stillbirth (0.9%, p=0.249) and neonatal death (2.8%, p=0.055).

Conclusion: The findings demonstrated that the newborns of women with hypertension are at higher risk to have adverse newborn outcomes compared to normotensive women in Gaza Strip. Preconception, early diagnosis and intensive prenatal follow-up would improve maternal and fetal prognosis.

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INTRODUCTION:

The hypertensive disorders of pregnancy (HDP) are major public health problems and may affect newborns with a lot of complications.[1] Worldwide, hypertensive disorders affect 10 percent of all pregnant women[2] and are associated with worse fetal outcomes such as abortion, low birth weight (LBW), intra uterine growth restriction, small for gestational age, stillbirth, neonatal admissions to hospitals and even neonatal death.[3,4] HDP is generally defined as a diastolic blood pressure of 90 mmHg or more, and/or systolic blood pressure of 140 mmHg or more. HDP are classified into: preexisting hypertension, gestational hypertension and preexisting hypertension with superimposed preeclampsia.[5]

In Qatar, the incidence of eclampsia is 0.31 per 1000 deliveries and leads to an increase of perinatal morbidity which mainly related to LBW and prematurity.[6] Chronic hypertension is associated with a significant increase in the risk of newborn cardiac malformations (OR, 1.6; 95% CI, 1.4–1.9) compared with normotensive controls.[7] Apgar scores of babies born to mothers with preeclampsia were lower at 1 minute after birth.[8] Neonatal complications (at least one) were more prevalent with women with eclampsia (25.5%) and women with pre-eclampsia (20.6%). The fetal deaths were higher among women with eclampsia (15.32%), women with pre-eclampsia (6.36%) than women without pre-eclampsia/eclampsia (1.87%).[9]

The preterm births were higher among mothers with HTN (43.9%) comparing with of mothers without HTN (18.3%).[10] Seventy-two percent of LBW infants in developing countries occur in Asia and 22% in Africa.[11] The babies with LBW were significantly more in the pregnancy-induced hypertension (PIH) group, where, babies with very LBW were found in the preeclampsia group and there was significant correlation between the birth weight and type of HDP (P= 0.01).[12] Intrauterine growth restriction was detected in 10% of fetuses of preeclampsia patients.[13,8]

Gaza Strip, the site of the study, is a narrow piece of land lying on the Mediterranean Sea in the South-West of Palestine; it is 40 km long and 9 km wide with an area of 360 square kilometers. The total population of GS is around 1.9 million which considered one of the highest densities in the world. Two thirds of the GS population are refugees (66.8%) who live in crowded permanent camps and receive basic health care services through United Nations Relief and Works Agency for Palestine Refugees (UNRWA).[14]

In Gaza Strip, there is no adequate information on the effect of PHD on adverse outcomes of the newborns. We hope this study will provide evidence-based data to reveal the possible adverse newborn outcomes in relation to hypertension in order to improve maternal and child health.

METHODOLOGY

Study design

To achieve the objectives of the study, a comparative cross-sectional analytical design was used. A sample consisted of two groups. First group included 215 women who either had chronic hypertension before pregnancy or women who developed PIH after 20 weeks of gestation in the recent pregnancy. Second group included 215 women without hypertension in the recent pregnancy. Any woman with other comorbidities such as diabetes mellitus or heart disease was excluded from the study.

Sampling approach

The study was conducted at 6 UNRWA's primary health care centers (PHCCs) distributed across Gaza Strip from August 2016 to May 2017. Sampling technique was based on three successive steps, stratified sampling, proportional and randomization. First, Gaza strip was stratified into three geographical areas, north, middle and south. Then 6 PHCCs were randomly selected from 21 PHCCs, tow health centers for each area. These were distributed as 2 from North area (Rimal and Sabra health centers), 2 from Middle area (Nuesirat and Dier-Balah health centers) and 2 from South area (Maan and Khan-Younis health centers). Then, the sample size for each PHCC was considered. This was based on its population coverage (the number of pregnant women receiving primary care services there). In the last step, the pregnant women registered with each PHCC were randomly selected using Excel randomization.

Data collection

Data were collected through face to face interviews using a structured questionnaire which contains personal data, socio-demographic characteristics, medical, obstetric and birth history, and outcomes of the last pregnancy. The second source of data was completing of abstraction sheet through reviewing mother's and newborn's e-medical files.

The validity and reliability of the questionnaire had been tested and established, using a pilot study with 20 mothers with HTN and 20 mothers without HTN in the last pregnancy and obtaining 12 experts' opinions, including gynecologists, midwives, research methodologists and family health specialists. Data were collected in the 6 PHCCs by the researchers and other three trained assistants who were trained how to apply the questionnaire and how to clarify any difficulties. The time allocated for each interview was around 25-30 minutes.

Data analysis

Data analysis was performed using the statistical package for social sciences (SPSS), version 22. Socio-demographic characteristics and obstetric profile values (e.g., age, gravidity, parity and history of abortion) were described using percentages and mean ± standard deviation. The Chi-square test was used to compare between the hypertensive and non-hypertensive women in regards to pregnancy and newborns outcomes (prematurity, hospital admission, neonatal death, abortion, etc.). A probability value (p) of less than 0.05 was considered statistically significant.

Ethical considerations

The ethical and managerial approvals were obtained from Helsinki research ethics committee at the Palestinian Ministry of Health and from UNRWA Health Department in Gaza field. In addition, the aim and objectives of the study were explained to all participants and informed consent form was obtained before voluntary participation.

RESULTS

Sociodemographic characteristics

Table 1 shows that most of study population (74%) belonged to the age group (21-35) years at last delivery; (68.8%) were hypertensive and (80.5%) were non-hypertensive ($p<0.05$). Only 9.3% of all participants belonged to age group 20 years and less, (9.8%) were hypertensive and (8.8%) were non-hypertensive. More than 21% of hypertensive women aged 35 years or older compared with only 10.7% of normotensive women.

Table 1: Sociodemographic information of studied pregnant women in 2016-17

Variable	Hypertensive		Non-hypertensive		Total		X^2	Sig.
	No.	%	No.	%	No.	%		
Age group of mothers (at last delivery)								
20 years old and less	21	9.8	19	8.8	40	9.3	9.174	0.008
21 – 35 years	148	68.8	173	80.5	321	74.7		
More than 35 years	46	21.4	23	10.7	69	16.0		
Total	215	100.0	215	100.0	430	100.0		
Maternal age at marriage by groups								
18 years and less	58	27.0	61	28.4	119	27.7	0.996	0.802
19 – 20 years	60	27.9	51	23.7	111	25.8		
21 – 24 years	70	32.6	75	34.9	145	33.7		
25 years and above	27	12.6	28	13.0	55	12.8		
Total	215	100.0	215	100.0	430	100.0		
Area of residence								
City	79	36.7	76	35.3	155	36.0	7.068	0.028
Village	48	22.3	71	33.0	119	27.7		

Camp	88	40.9	68	31.6	156	36.3		
Total	215	100.0	215	100.0	430	100.0		
Level of education								
Elementary school	56	26.0	45	20.9	101	23.5	4.005	0.261
Secondary school	79	36.7	76	35.3	155	36.0		
Diploma	14	6.5	24	11.2	38	8.8		
University or higher	66	30.7	70	32.6	136	31.6		
Total	215	100.0	215	100.0	430	100.0		
Employment								
Yes	19	8.8	20	9.3	39	9.1	0.028	0.500
No	196	91.2	195	90.7	391	90.9		
Total	215	100.0	215	100.0	430	100.0		
Family income by US$								
Less than 300	100	46.5	100	46.5	200	46.5	0.197	0.906
From 300 to 600	82	38.1	85	39.5	167	38.8		
Above 600	33	15.3	30	14.0	63	14.7		
Total	215	100.0	215	100.0	430	100.0		

Regarding marital age, it was noticed that 32.6% of hypertensive women and 34.9% of non-hypertensive women got married at age group of 21-24 years. About 27% of hypertensive women get married at age 18 years and less. The mean ± SD of marital age of hypertensive was 20.8 ± 3.7 compared to 20.3 ± 3 of non-hypertensive. No statistical differences were found between the two groups in marital age (table 1). There are statistical differences between hypertensive and non-hypertensive groups regarding area of residence (χ^2 = 7.068, Sig. = 0.028). About 40.9% of hypertensive group and 31.6% of non-hypertensive group live in permanent refugee camps. Regarding the mothers' education level, about 30% of hypertensive mothers got university education in comparison with 32% non-hypertensive (no statistically significant differences, p=0.261). The employment status revealed that only 8.8% of hypertensive and 9.3% of non-hypertensive are employed, while, the majority of mothers (90.9%) are not working. Most of the women (46.5%) were poor with monthly income less than 300 US$. No statistical differences between the two groups (p=0.906).

Obstetric characteristics

Table (2) shows that there is a statistically significant differences between hypertensive and non-hypertensive in the variables of gravidity (χ^2 = 10.457, Sig. = 0.005), parity (χ^2 = 6.859, Sig. = 0.023) and abortion (χ^2 =11.412, Sig. = 0.003) in favor of hypertensive women. Gravidity was significantly higher especially in the extreme categories (less than 3; seven or more). Parity mean for hypertensive (3.4) was higher than non-hypertensive (2.7). Only 12.6% of normotensive women had (twice and more) abortions compared with 21.9% of hypertensive women. Table (2) also shows that the mothers who received preconception care (PCC) were (21.4%); (20.0%) of hypertension group and (22.8%) of non-hypertensive group.

Table (2): Obstetric characteristics of hypertensive and normotensive women

Variable	Hypertensive		Non-hypertensive		Total		X^2	Sig.
	No.	%	No.	%	No.	%		
Gravidity								
Three and less	107	49.8	125	58.1	232	54.0	10.457	0.005
From 4 to 7	73	34.0	76	35.3	149	34.7		
More than 7	35	16.3	14	6.5	49	11.4		
Total	215	100.0	215	100.0	430	100.0		
Parity								
Three and less	122	56.7	144	67.0	266	61.9	6.859	0.023
From 4 to 7	78	36.3	65	30.2	143	33.3		
More than 7	15	7.0	6	2.8	21	4.9		
Total	215	100.0	215	100.0	430	100.0		
Abortion								
Never	119	55.3	152	70.7	271	63.0	11.412	0.003
Once	49	22.8	36	16.7	85	19.8		
Twice and more	47	21.9	27	12.6	74	17.2		
Total	215	100.0	215	100.0	430	100.0		
Interval between the last delivery and the previous one (months)								
18 months and less	30	21.9	46	28.0	76	25.2	12.464	0.006
From 19 to 30	38	27.7	47	28.7	85	28.2		
From 31 to 48	31	22.6	51	31.1	82	27.2		
Above 48	38	27.7	20	12.2	58	19.3		
Total	137	100.0	164	100.0	301	100.0		
Preconception care								
Yes	43	20.0	49	22.8	92	21.4	0.498	0.278
No	172	80.0	166	77.2	338	78.6		
Total	215	100.0	215	100.0	430	100.0		

T-test obstetric profile differences

Table (3) shows that there are no statistical significant differences between the hypertensive mothers and non-hypertensive mothers in gestational age at registration (weeks) and haemoglobin level (p=0.358 and 0.421 respectively), while there are statistical significant differences between the two groups in routine antenatal care visit, mean systolic and diastolic BP, body mass index and postnatal care (p<0.05), all the differences were for hypertensive respondents.

Table (3): T-test obstetric profile differences

		N	Mean	SD	t-test	Sig.
Gestational age at registration (weeks)	Hypertensive	215	10.9	5.3	-0.921	0.358
	Non-Hypertensive	215	11.4	5.6		
Body mass index	Hypertensive	215	30.7	5.6	10.116	0.001

	Non-Hypertensive	215	25.8	4.4		
Haemoglobin level	Hypertensive	215	10.8	0.8	-0.806	0.421
	Non-Hypertensive	215	10.9	0.9		
Routine antenatal care visit (number)	Hypertensive	215	8.1	2.6	6.040	0.001
	Non-Hypertensive	215	6.7	2.2		
Systolic blood pressure	Hypertensive	215	122.1	8.2	23.684	0.001
	Non-Hypertensive	215	106.7	4.9		
Diastolic blood pressure	Hypertensive	215	81.3	5.9	24.356	0.001
	Non-Hypertensive	215	68.8	4.7		
Postnatal care attendance in days	Hypertensive	215	9.20	4.912	3.146	0.002
	Non-Hypertensive	215	7.86	3.855		

New-borns' outcomes

The birth outcomes were 210 singletons and 5 twins among hypertensive mothers, while, 209 and 6 among non-hypertensive respectively. Moreover, the distribution of new-borns for hypertensive mothers was 116 males and 99 females compared with 103 males and 112 females for non-hypertensive mothers. Table (4) shows that there are 2 cases (0.9%) of stillbirths for hypertensive women, whereas no stillbirth was registered among non-hypertensive group. The two cases of stillbirth were preterm (< 37 weeks of gestation). Regarding neonatal deaths, (6 vs. 1) cases of deaths happened to hypertensive and non-hypertensive groups respectively. There was no statistical difference between the newborn of two groups in stillbirths and neonatal death ($p > 0.05$). The birth weight means of newborns of hypertensive mothers (μ=3041.6±587.6) was significantly lower than that of normotensive group (μ=3404.4±456.9) (Sig= 0.003). It is demonstrated that 21 newborns (10.0%) of hypertensive and 6 (2.9%) of non-hypertensive group had an LBW. Table (4) also shows that the percentage of preterm birth among hypertensive women (11.5%) was higher than non-hypertensive (7.6%) with statistically significant difference ($\chi^2 = 6.114$, p= 0.013). Neonatal admission to the hospitals is found in 12.5% of hypertensive newborn and 6.7% in non-hypertensive. This difference reached statistically significant level ($\chi^2 = 4.06$, P = 0.044).

Table (4): Perinatal outcomes

Variable	**Hypertensive**		**Non-hypertensive**		**Total**		χ^2	***p-value***
	No.	**%**	**No.**	**%**	**No.**	**%**		
Birth								
Alive	213	99.1	215	100.0	428	99.5	2.009	0.249
Stillbirth	2	0.9	0	0.0	2	0.5		
Total	215	100.0	215	100.0	430	100.0		
Birth weight								

Normal	180	85.7	185	88.5	365	87.2	11.4	0.003
Low	21	10.0	6	2.9	27	6.4		
High	9	4.3	18	8.6	27	6.4		
Total	210*	100.0	209*	100.0	419*	100.0		
Preterm birth								
Yes	32	15.4	16	7.6	48	11.5	6.114	0.013
No	176	84.6	193	92.4	369	88.5		
Total	208**	100.0	209**	100.0	417**	100.0		
Neonatal admission to hospital								
Yes	26	12.5	14	6.7	40	9.6	4.06	0.044
No	182	87.5	195	93.3	377	90.4		
Total	208	100.0	209	100.0	417	100.0		
Neonatal death								
Yes	6	2.8	1	0.5	7	1.6	3.67	0.055
No	207	97.2	214	99.5	423	98.4		
Total	213***	100.0	215	100.0	428	100.0		
* 5 and 6 Twins were excluded from hypertensive and non-hypertensive respectively ** 2 Stillbirths and 5 twins were excluded from hypertensive and 5 twins from non-hypertensive *** 2 stillbirths were excluded								

DISCUSSION

This study aimed to explore the possible adverse effect of HDP on newborn health among women attended UNRWA's health care services in Gaza strip. Generally, our study indicated that newborns of hypertensive mothers are still at increased risk for developing adverse pregnancy outcomes in comparison to newborns of normotensive mothers.

The socio-demographic profile pointed out higher numbers of hypertensive women aged 35 years or more, lived in refugee camps and had lower education levels compared with the non-hypertensive. This resulted in higher risk for adverse newborn outcomes. These findings are congruent with Fayed et al., 2017 who found that the advanced maternal age was associated with increased risk of preterm and CS deliveries.[16] Adu-Bonsaffoh et al. (2014) found a statistical relationship between increased age and adverse pregnancy outcomes.[17] Islam (2015) indicated that mothers aged ≥35 years were at increased risks of spontaneous abortion, preeclampsia, cesarean section delivery, prolonged labor, and gestational diabetes compared with adult mothers aged 20–34 years.[18] Eljedi (2005) reported that refugees' camps environment in Gaza strip is characterized by over-crowdedness, poor infrastructure, high unemployment rate and lack of health services. All had a negative impact on Palestinian women health and perinatal outcomes.[19]

Regarding the obstetric profile, our results demonstrated that the hypertension during pregnancy was significantly positively associated with higher gravity and parity, increased BMI, and multiple past history of abortion. These results are consistent with the findings of Ayele et al. (2016) who found that age of mothers > 30 years, BMI >30 mg/kg2 and multi gravid were significant factors for PIH.[20] Saxena et al. (2014) and Zhang (2007) found that PIH is more common in women of high maternal age, multiple pregnancies and obese.[21,22] A retrospective study conducted in Tanzania found that mothers with five gravid and more are at higher risk to have fetomaternal morbidity and mortality in developing countries.[23] In contrast to our findings, Sajith et al. (2014) found that the incidence of hypertension in pregnancy was highest among primigravidae.[24] This might be explained by other studies which found that both multigravida and primigravidae are at higher risk to

have adverse pregnancy outcomes if associated with extreme ages (less than18 or higher than 35 years old).[24,12] Moreover, our study indicated that no statistically significant differences were found between the two groups regarding preconception care, early registration for antenatal care and the interval between births.

Regarding the newborns' outcomes, our study showed that the incidence of *LBW* was significantly higher among women with HDP. This result is consistent with Khader et al. (2017) who found that in Jordan the rates of LBW delivery (32.5% vs. 8.3%) were significantly higher among women with preeclampsia.[25] Muti et al. (2015) also found that women with PIH were more likely three times to deliver a LBW baby (OR 3.0, p = 0.01).[26] In Sudan, a prospective observational hospital-based study shows that most of the babies with LBW were found in the PIH group, where, babies with very LBW were found in the preeclampsia group and there was significant correlation between the birth weight and type of hypertensive disorder in pregnancy (P= 0.01).[12] Moreover, WHO multi-country survey showed that the LBW incidence of was 34.3% among women with pre-eclampsia and 44.6% among women with eclampsia.[9]

Our results indicated that the percentage of *preterm birth* among newborn of hypertensive mothers was significantly higher than non-hypertensive (p=0.013). This result is congruent with a study conducted in Egypt which found that the preterm births were higher among mothers with HTN (43.9%) comparing with mothers without HTN (18.3%).[10] Dekker et al. (2012) also found that mild HTN was a risk factor for preterm birth (OR-9.65, 95%, CI 2.5-37.1).[27]

This study indicates that the *neonatal admission to hospitals* among newborns of hypertensive group was more than newborns of non-hypertensive group (P = 0.044). This finding is in consistent with other results of this study. As long as the incidence of LBW and prematurity among newborns of women with HDP was higher, increased admission rate is expected. Abalos et al. (2014) supported this result by finding that the intensive care unit admission for newborns of women with eclampsia was (32.02%) compared with women without pre-eclampsia/eclampsia (6.24%).[9] Moreover, Mendola et al. (2015) reported that neonatal intensive care unit admission have increased in infants born to mothers with hypertensive pregnancies compared to normotensive pregnancies, regardless of the severity of the hypertensive disease.[28]

Our study results indicated lower incidence rates of *stillbirth and neonatal death* (0.9% and 2.8% respectively) among women with hypertension compared with most of the studies worldwide. In low- and middle-income countries, for every 1000 total births in 2015, 18.4 babies were stillborn.[29] The incidence of stillbirth was 13 in Jordan and Egypt per 1000 in in 2013.[30] Muti et al. (2015) found that women with PIH were 4.3 times more likely to have stillbirth (OR 4.34, p = 0.0517) in Zimbabwe.[26] Another cross-sectional study shows stillbirth incidence was higher among women with eclampsia (15.3%), women with pre-eclampsia (6.4%).[9] On the other hand, according a study conducted in the United States showed that the hypertensive disorders responsible for 9.2% of all stillbirths.[31] Also this result is not consistent with Korde (2008) who found that the stillbirth rate was 35.2/1000 in India.[32] Such inconsistency may be attributed to the differences between the methodologies, the selected target populations and sample size. To get an accurate neonatal mortality rate, this needs a population-based study with relatively large sample which was not convenient in our study.

CONCLUSION

In conclusion, the findings of the study demonstrated that HDP is an important and challenging public health problem in Gaza strip. Newborn of hypertensive women are at higher risk to have adverse outcomes (LBW, prematurity, admission to hospital) compared to newborn of women without hypertension. Adopting a national policy to improve the child healthcare in primary, secondary and tertiary levels in addition to expansion of preconception and antenatal care are crucial keys to reduce adverse pregnancy outcomes and improve maternal and fetal prognosis.

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ETHICAL APPROVALS

The ethical approval was obtained from Helsinki research ethics committee at the Palestinian Ministry of Health in Gaza strip.

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