The impact of socio-economic, lifestyle habits, and obesity in developing of pregnancy-induced hypertension in fast-growing country: global comparisons

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Summary

Objective: The aim of the study was to determine the prevalence and associated risk factors of pregnancy-induced hypertension (PIH) in the third trimester of Arab women and their neonatal outcome. *Design:* A prospective study. *Setting:* Women's Hospital and Maternity Clinics. *Subjects and Methods:* The study was based on pregnant women in third trimester from the first week of January 2010 to April 2011. A total of 2,056 pregnant women, who had any kind of maternal complications, were approached and 1,608 women (78.2%) expressed their consent to participate in the study. A questionnaire covered variables related to socio-demographic factors, family history, medical history, maternal complications, and neonatal outcome. Multiple logistic regressions were used to describe the relationship between socio-demographic factors and PIH. *Results:* Pregnant women with Qatari nationality were 30% more likely to have PIH (Adj. OR 0.7; 95% CI 0.5-0.9, p = 0.03). Those living in villas were 50% more likely than those living in apartments (Adj. OR 0.5; 95% CI 0.3-0.9) and 40% more likely than those living in traditional houses (Adj. OR 0.6; 95% CI 0.4-0.8) to have PIH. The odds of PIH linearly increases with each decrease of 5,000 QAR in monthly income from > 20,000 to 10-15,000 (Adj. OR 1.2; 95% CI 0.7-2.1, Adj. OR 1.9; 95% CI 1.1-3.2, respectively) and then it starts decreasing from 10,000 to < 5,000 monthly income (Adj. OR 1.8;95% CI 1.1-3.1 and Adj. OR 1.3; 95% CI 0.7-2.7 respectively). The odds of PIH linearly increase with each five years increase in age among pregnant women from 30 to 45 years of age. A 10-fold increase in PIH odds was observed when body mass index (BMI) increased above ≥ 30 (obese) (Adj. OR 10.0; 95% CI 6.4-15.6). Pregnant women who had no history of previous abortion were 60% less likely than those who had positive history of previous abortion (Adj. OR 1.6; 95% CI 1.1-1.2; p = 0.007) to have PIH. The odds of PIH increases by 50% when women do not receive antenatal care (Adj. OR 1.5; 95% CI 1.1-2.1; p = 0.040). *Conclusion:* Qatar has a high prevalence of PIH compared to both regional and global rates. Maternal age > 30, increased BMI, previous abortion, lack of antenatal care, and physical activity were found to be significantly associated with increased risk of PIH in Arab women and could be potentially modifiable risk factors.

Key words: SES; Consanguinity; Life-style habits; Obesity; Gestational diabetes; Pregnancy-induced hypertension; Type of delivery.

Introduction

Pregnancy-induced hypertension (PIH) is one of the most common complications that occur during pregnancy and occurs in between 6-8% of pregnancies [1]. The two main conditions that comprise PIH are gestational hypertension and preeclampsia. Gestational hypertension is a more mild form of hypertension that does not result in many complications during pregnancy; nonetheless it has been found by a number of studies to predispose women to future chronic hypertension [2, 3]. Preeclampsia, on the other hand, is known to cause many detrimental complications to both the mother and the fetus, such as placental abruption, cerebrovascular accident, end-organ failure, disseminated intravascular coagulation [4] low birth weight [5], cesarean section deliveries [6], and even cases of neonatal and maternal death [7, 8].

A number of global studies have documented some of the common risk factors associated with PIH; these include nulliparity, maternal obesity, insulin resistance, multiple gestation, preexisting hypertension, and gestational diabetes mellitus (GDM) [1-3, 7-11]. While these studies have documented these general risk factors for PIH, to date, no study has been conducted in Qatar to determine the specific socio-demographic and biological risk factors associated with PIH.

It is particularly important to investigate the maternal factors associated with PIH in Qatar, as Qatar is currently undergoing rapid economic development. It now boasts one of the highest per capita incomes in the world. Such development has been accompanied by rapidly increasing rates of obesity [12]; type 2 diabetes mellitus, and the metabolic syndrome [13]. A number of studies conducted in Qatar have noted that women are particularly vulnerable and susceptible to developing each of these chronic illnesses [14]. This is an especially worrying trend for women of childbearing age, where there is a greater potential for poor obstetric and fetal outcomes.

Thus the aim of this study was to determine the prevalence and associated risk factors of pregnancy-induced hypertension in the third trimester of Arab women and their neonatal outcome.

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Materials and Methods

This is a prospective hospital based study which was conducted among Arab pregnant women in the third trimester over a period from January 2010 to April 2011. The study was based on the logbook of the Women's hospital which registers all pregnant women visiting antenatal clinics of the Women's Hospital of the Hamad Medical Corporation. The research assistants screened the outpatient register of Women's hospital during the study period and prepared a list of 2,056 Arab pregnant women above 28 weeks who came to the outpatient clinic with a complication in their pregnancy. A series of pregnant women with complications were taken consecutively from the register and included in the study sample. Only participants who agreed to participate were included in the study. A total of 2,056 pregnant women, who had any kind of maternal complications, were approached and 1,608 women (78.2%) expressed their consent to participate in the study; 448 women were excluded from the study due to incomplete questionnaires or did not want to respond to the questionnaire due to lack of time. Research Assistants screened medical files of the subjects for any queries about the pregnancy and neonatal complications.

In 2010, there were a total of 16,188 deliveries in the Women's Hospital. Our study sample included 1,608 pregnant women which is 9.9% of the mothers who delivered. The study was approved by both the institutional review board (IRB) at Weill Cornell Medical College and Hamad Medical Corporation prior to commencing data collection. Each participant was provided with brief information about the study and was assured of strict confidentiality.

In the State of Qatar, cost-free health care is offered to all pregnant women in maternity clinics at the Primary Health Care (PHC) Center and Women's Hospitals. Practically all pregnant women attend these clinics. During the study period, GDM screening in the PHCs and hospitals were based on assessment of risk factors, in accordance with national guidelines. Women were considered to be at risk if one or more of the following factors were present: age over 40 years, body mass index (BMI) of 25 kg/m^2 or greater, prior GDM, previous delivery of a macrosomic infant (birth weight > 4,500 g), glucosuria, and suspected fetal macrosomia in the current pregnancy. These women underwent diagnostic glucose tolerance testing, performed after an overnight fast, conducted by administering a 2-h, 75-g oral glucose tolerance test (OGTT). Diagnosis of GDM was set after one abnormal value in the OGTT.

Definitions. Age was considered as a continuous variable and dichotomized as under/over 40 years. Glucosuria during pregnancy was dichotomized as ever/never, and the number of abnormal values in the OGTT during pregnancy as one/several. Mean arterial pressure (MAP) after gestation week 36 was calculated using the formula MAP = diastolic blood pressure + (systolic blood pressure – diastolic blood pressure/3). Gestational hypertension was defined as systolic blood pressure exceeding 140 mm Hg or diastolic blood pressure exceeding 90 mm Hg, and preeclampsia was defined as proteinuria and blood pressure exceeding the aforementioned values after gestation week 20.

The primary outcomes were preeclampsia and gestational hypertension defined according to research criteria [1] using blood pressure (BP) recordings from prenatal visits; measurements during labor were not used to define pregnancy outcomes. Preeclampsia was defined as the new onset of hypertension (BP ≥ 140/90 mmHg) after 20 weeks of gestation in association with proteinuria, either ≥ 2 + by dipstick or ≥ 300 mg/24 h in the absence of urinary infection. Gestational hypertension was defined as the new onset of isolated hypertension that first appeared after 20 weeks of gestation [1]. Blood pressures were measured from subjects' right arm using standard sphygmomanometers after they were seated at rest for 3-5 min. After selecting the proper cuff size on the basis of right midarm circumference, BP readings that coincided with the timing of the first (systolic) and fifth (diastolic) Korotkoff sounds were recorded. Hypertensive BP readings were repeated 5-10 min. later; if the subsequent readings were also elevated, they were recorded in the EMR.

A well-designed and pilot tested questionnaire was used to collect data. A face-to-face interview was conducted by qualified nurses using a validated self-administered questionnaire in the local language. The questionnaire covered socio-demographic characteristics of the pregnant women, family and medical history, type of maternal complication, and the pregnancy and neonatal outcome. A translated Arabic version of the questionnaire was revised by a bilingual consultant. The survey instrument was then tested on 100 randomly selected pregnant women from the list for the validity of the questionnaire. The investigators had made the necessary corrections and modifications after considering the minor differences and discrepancies that had been found during the pilot study.

Statistical analyses were performed using SPSS Version. 18.0 (SPSS Inc., Chicago, IL). Fisher's exact test and chi-square analysis were performed to test for differences in the proportions of categorical variables between two or more groups. Student's t-test (two-tailed) was used to determine the significance of difference between two continuous variables and confirmed by a non-parametric Mann-Whitney test. Multiple logistic regression analysis using the forward inclusion and backward deletion method was used to assess the relationship between dependent and independent variables and to adjust for potential confounders and orders the importance of risk factors (determinant) for the PIH. All multivariable analyses were adjusted for gestational age at the time of the first prenatal visit in order to account for variation in baseline BP and BMI that was associated with differences in the gestational age when they were measured. The level $p < 0.05$ was considered as the cut-off value for significance.

Results

Table 1 shows the prevalence and socio-demographic risk factors of PIH among pregnant women visiting the Women's hospital.

Table 2 gives prevalence and biological risk factors of PIH among pregnant women visiting the Women's hospital.

Table 3 shows multivariable analysis for predictors of PIH. Pregnant women with Qatari nationality were 30% more likely to have PIH (Adj. OR 0.7; 95% CI 0.5-0.9, p value 0.03). Those living in villas were 50% more likely than those living in apartments (Adj. OR 0.5; 95% CI 0.3-0.9) and 40% more likely than those living in traditional houses (Adj. OR 0.6; 95% CI 0.4-0.8) to have PIH. The risk of PIH linearly increases with each decrease of 5,000 QAR in monthly income from > 20,000 to 10-15,000 (Adj. OR 1.2; 95% CI 0.7-2.1, Adj. OR 1.9; 95% CI 1.1-3.2, respectively) and then it starts decreasing from 10,000 to < 5,000 monthly income (Adj. OR 1.8;95% CI 1.1-3.1, and Adj. OR 1.3; 95% CI 0.7-2.7, respectively).

Table 1. — *Prevalence and socio-demographic risk factors of pregnancy-induced hypertension among pregnant women visiting the Women's Hospital.*

Variables	N	Prevalence of PIH n (%)	Crude OR (95% CI)	*P**
Total number of subjects	1608	279 (17.4%)		
Age group (yrs)				
< 30 yrs (ref)	635	97 (6.0)	1	
30-34	403	58 (3.6)	0.9 (0.6-1.3)	0.007
35-39	336	72 (4.5)	1.5 (1.1-2.1)	
40-45	234	52 (3.2)	1.6 (1.1-2.3)	
BMI				
< 25 (ref)	513	26 (1,6)	1	
25-30	601	77 (4.8)	2.7 (1.7-4.3)	< 0.001
> 30	494	176 (10.9)	10.4 (6.7-16.0)	
Nationality				
Qatari (ref)	746	146 (9.1)	1	0.029
Non-Qatari	862	133 (8.3)	0.8 (0.6-0.9)	
Education level				
Illiterate	103	12 (0.8)	0.6 (0.4-1.3)	
Primary	151	37 (2.3)	1.7 (1.1-2.5)	
Intermediate	152	30 (1.9)	1.3 (0.8-1.9)	0.070
Secondary	524	89 (5.5)	1.0 (0.7-1.4)	
University (ref)	678	111 (6.9)	1	
Occupation				
House wife	975	176 (10.9)	0.9 (0.6-1.5)	
Sedentary/ Professional	443	68 (4.2)	0.8 (0.5-1.3)	0.250
Police/Army/ Manual (ref)	190	35 (2.2)	1	
Housing condition				
Villa (ref)	1053	211 (13.1)	1	
Traditional house	425	55 (3.4)	0.6 (0.4-0.8)	< 0.001
Apartment	130	13 (0.8)	0.4 (0.2-0.8)	
Consanguinity				
Yes	796	156 (9.7)	1.4 (1.1-1.8)	0.019
No (ref)	812	123 (7.6)	1	
Monthly income (QR)				
< 5,000	141	20 (1.2)	1.1 (0.6-2.1)	
5,000-9,999	614	117 (7.3)	1.6 (0.9-2.5)	
10,000-14,999	335	73 (7.3)	1.9 (1.1-3.1)	0.014
15,000-20,000	349	47 (2.9)	1.0 (0.6-1.8)	
> 20,000 (ref)	169	22 (1.4)	1	

* *p* value = two sided *p* value based on -2 log likelihood test, ref = reference category. PIH = Pregnancy-induced hypertension, Crude OR = Crude odds ratios based on univariate logistic regression, QR = Qatari Rayal.

Risk of PIH linearly increased with each five years increase in age among pregnant women from 30 to 45 years of age. The risk of PIH synergistically increases to 10-fold when BMI increases above ≥ 30 (obese) (Adj. OR 10.0; 95% CI 6.4-15.6). The risk of PIH among pregnant women who have no history of previous abortion is 60% less than those who have positive history of previous abortion (Adj. OR 1.6; 95% CI 1.1-1.2; p = 0.007). The risk of PIH increases by 50% when the women do not receive antenatal care (Adj. OR 1.5; 95% CI 1.1-2.1; p = 0.040).

Table 4 presents characteristics and comparison of differential risk of hypertensive disorders of pregnancy among Hispanic, Caucasian, and Qatari women. All variables showed statistically significant differences for the risk of PIH ($p < 0.01$), except for gestational weeks.

Table 2. — *The impact of family history, lifestyle, and biological risk factors on pregnancy-induced hypertension among pregnant women.*

Variables	N	Prevalence of PIH n (%)	Crude OR (95% CI)	*P**
Total number of subjects	1608	279 (17.4%)		
Family history of diabetes				
Yes	255	51 (3.2)	1.2 (0.9-1.7)	0.224
No (ref)	1353	228 (14.2)	1	
Family history of hypertension				
Yes	298	64 (4.0)	1.4 (1.1-1.9)	0.038
No (ref)	1310	215 (13.4)	1	
Family history of down syndrome				
Yes	291	68 (4.2)	1.6 (1.2-2.2)	0.003
No (ref)	1317	211 (13.2)	1	
Physical activity				
Vigorous	392	75 (26.9)	1	
Moderate	409	84 (30.1)	0.9 (0.7-1.4)	0.021
None	807	120 (43.0)	1.3 (1.0-1.9)	
Smoking/Sheesha				
Yes	87	10 (0.6)	1.6 (0.8-3.2)	0.142
No (ref)	1521	269 (16.7)	1	
Parity				
< 2 (ref)	432	63 (3.9)	1	
2-3	428	65 (4.1)	1.1 (0.7-1.5)	0.022
4-6	666	130 (8.1)	1.4 (1.1-1.9)	
> 6	82	21 (1.3)	2.0 (1.1-3.5)	
Antenatal care				
Yes (ref)	1248	231 (14.4)	1	0.023
No	360	48 (3)	1.5 (1.1-2.1)	
Previous abortion				
Yes	291	70 (4.4)	1.7 (1.2-2.3)	0.001
No (ref)	1317	209 (13)	1	
Neonatal birth weight (g)				
2,500-4,000 (ref)	1371	233 (14.5)	1	
< 2,500	107	13 (0.8)	0.7 (0.4-1.2)	0.020
> 4,000	130	33 (2.1)	1.7 (1.1-2.5)	
APH§				
Yes	246	26 (1.6)	1.9 (1.3-2.9)	0.003
No (ref)	1362	253 (15.7)	1	

* *p* value = two sided *p* value based on -2 log likelihood test, ref = reference category. PIH = Pregnancy-induced hypertension, Crude OR = Crude odds ratios based on univariate logistic regression, § APH = Anti partum hemorrhage.

Discussion

Our study indicates a very high prevalence of PIH (17.4%) in comparison to other studies conducted in the region and globally (Table 5). Regional rates mentioned in published studies range between 2.32% in Iran [15] to 8.49% in Turkey [16]. Global rates on the other hand range from 7.5% in Brazil [17], from 6.3% to 10% in Canada [3], 13.9% in Northern Finland [18] and 3.6% in Singapore [19]. A possible explanation for the high rates found in our study could be attributed to the rising metabolic syndrome (MetS) epidemic [20] where T2DM and HPT rates are reaching alarming levels in the general population of Qatar [12-14]. Indeed a number of studies conducted in the USA [21, 22] have noted when comparing White and Black women, that Black women were more likely to have PIH and complications because Black women of reproductive age, are more likely to have a comorbidity or pre-existing medical condition, such as hypertension, diabetes, or obesity.

Table 3. — *Multivariable analysis for predictors of pregnancy induced hypertension in Qatar (n = 1608).*

Predictors	Adjusted OR (95% CI)	*p**
Age group (yrs)		
< 30 yrs (ref)	1	
30-34	1.1 (0.7-1.5)	0.025
35-39	1.6 (1.2-2.4)	
40-45	1.5 (1.1-2.3)	
BMI		
< 25 (ref)		1
25-30	2.6 (1.6-4.1)	< 0.001
> 30	10.0 (6.4-15.6)	
Nationality		
Qatari (ref)	1	0.037
Non-Qatari	0.7 (0.5-0.9)	
Housing condition		
Villa (ref)	1	
Traditional house	0.6 (0.4-0.8)	0.004
Apartment	0.5 (0.3-0.9)	
Monthly income (QR)		
< 5,000	1.3 (0.7-2.7)	
5,000-9,999	1.8 (1.1-3.1)	
10,000-14,999	1.9 (1.1-3.2)	0.049
15,000-20,000	1.2 (0.7-2.1)	
> 20,000 (ref)	1	
Previous abortion		
Yes	1.6 (1.1-2.2)	0.007
No (ref)	1	
APH§		
Yes	2.0 (1.3-3.1)	0.003
No (ref)	1	
Ante partum care		
Yes (ref)	1	0.040
No	1.5 (1.1-2.1)	

ref = reference category, § APH = anti partum hemorrhage, Adjusted OR (95% CI) = Adjusted odds ratios based (95% confidence interval), *Two sided *p* value based on -2 log likelihood statistics.
Model based on backward logistic regression, Model goodness of fit tested with Hosmer-Lemeshow goodness of fit test.

Table 4. — *Characteristics and comparison of differential risk of hypertensive disorders of pregnancy among Hispanic, Caucasian, and Qatari women**.

	Hispanic n = 863	Caucasian n = ,381	Qatari n = 1,608	*p**
Baseline characteristics				
Age (yrs)	22.6 ± 5.2	30.0 ± 5.4	32.2 ± 6.4	< 0.01
BMI (kg/m^2)	22.5 ± 5.4	24.5 ± 4.7	27.8 ± 5.4	< 0.01
Systolic BP (mmHg)	107 ± 11	113 ± 11	125 ± 8.9	< 0.01
Diastolic BP (mmHg)	65 ± 8	71 ± 8	77 ± 8.4	< 0.01
Smoking (%)				
Yes	46	37	4.9	< 0.01
No	44	39	95.1	< 0.01
Gestational diabetes (%)	2.6	2.5	16.3	< 0.01
Prenatal visits (#)§	12 ± 3	12 ± 3	10 ± 3.1	< 0.01
Gestational age (wks)	39.7 (38.7-40.7)	39.7 (38.7-40.7)	39 (38-40)	NS
Preterm delivery (%)	13	16	8.6	< 0.01
Cesarean section (%)	16	26	20.6	< 0.01
Birth weight (g)	3231 ± 525	3373 ± 578	3268 ± 513.3	< 0.01

Continuous variables are reported as Mean ± SD or median (interquartile range) as appropriate.
* Wolf *et al.*: "Differential risk of hypertensive disorders of pregnancy among Hispanic women". *J. Am. Soc. Nephrol.*, 2004, *15*, 1330.
** NS, not statistically significant.
§ Visits refer to the number of routinely scheduled visits with obstetricians or midwives and excludes emergency, urgent care or unscheduled walk-in visits.

The rising PIH and MetS epidemic is largely a result of the rapidly developing affluence in the region which is often accompanied by the adoption of unhealthy diets and sedentary lifestyles [12-14, 23] and obesity [12, 24]. In the current study, relative affluence was associated with developing PIH where relatively affluent housing conditions (living in a villa) and middle-high salaries (10,000-14,999 QR/month) were more strongly associated with developing PIH. This is unlike other studies which tend to note that those in lower socio-economic status to be at higher risk of developing PIH [19, 21, 22]. In these studies this is attributed to lower standards of healthcare and this tends to be the case in higher economically developed nations.

It is unsurprising that obesity, being one of the main components of the MetS, is strongly associated with PIH in our study. Similarly, other studies have noted associations between obesity (BMI ≥ 30 kg/m^2) and PIH with OR of 4.67 (95% confidence interval: 3.07-7.09) in an Dutch study [20]; OR 2.5 (95% CI 1.3-4.8) among Latin women in a US study [25] and OR 4.26 (95% CI 3.37-5.38) for those with a BMI of ≥ 40 kg/m^2 in another US study [26] and in Qatari's studies [12-14]. Interestingly, in comparison to other published studies, our study has as of yet reported the highest OR odds (OR 10.0 95% CI 6.4-15.6) for associations between BMI ≥ 30 kg/m^2 and PIH.

In the current study, maternal age was also associated with PIH. In our study, risk of PIH linearly increased with each five years increase in age among pregnant women from 30 to 45 years of age. This finding is similar to what was reported in a Canadian study [27] which found that the odds increased by almost two-fold for incidence of PIH for women aged ≥ 35 years in comparison to those younger than 35 years. Another study conducted in Brazil found a five-fold increase (OR 5.218; 95% CI: 1.873-14.536) in odds of PIH among women aged over 30 years old in comparison to those younger than 30 years [28]; nonetheless age above 30 years was found to be protective against preeclampsia in this Brazilian study [28]. It is important to note, as reported in numerous international studies, that those below 20 years of age were at increased risk of preeclampsia [29]. We found increased risk among those who were above 30 years as they are more predisposed to the usual risks of hypertension that exists in the general population, namely obesity and type 2 DM [30-32].

In addition, there may be a genetic explanation for the high rates of PIH in Qatar. Our study demonstrated significantly higher rates of PIH among Qatari's in comparison to other Arabs residing in Qatar. A recent study conducted in the USA comparing race and predisposition to gestational DM found Asians and Latinos, to have higher risk than Caucasians or African Americans [33]; The authors proposes that Asians in general have a genetic predisposition to insulin resistance. It may well be the case that a similar genetic predisposition for PIH exists; nonetheless

Table 5. — *Global prevalence rate (%) of pregnancy-induced hypertension across different countries*.

Country	Reference	Sample size	Diagnostic Criteria	Prevalence rate (%)
Iran	15. Zibaeenezhad. *et al*. 2010	24,196	Preeclampsia (proteinuria and increased blood pressure after 20 weeks of gestation), gestational hypertension	2.32% preeclampsia 0.17%, eclampsia 0.03% (140/90 mmHg)
Turkey	16. Yucesoy *et al*. 2005	5,155		8.49%
Brazil	17. Gaio *et al*. 2001	4,892		7.5%
Finland	18. Kaaja *et al*. 2005	3,650	Preeclampsia (proteinuria and increased blood pressure after 20 weeks of gestation), gestational hypertension (140/90 mmHg)	Southern Finland…..……7.9% Northern Finland……13.9% Eastern Finland……..11.1%
Singapore	19. Tan *et al*. 2006	61,595	Preeclampsia (proteinuria and increased blood pressure after 20 weeks of gestation), gestational hypertension (140/90 mmHg)	Incidence of 3.6% had preeclampsia between 1999-2003.
China	24. Liu. *et al*. 2009	83,159		11.01%
Canada	27. Walker *et al*. 2009	133,118 live births and stillbirths b/w 1995-2004.	Cases were identified by the ICD-9-CM (nonproteinuric 642.0, 642.3, 642.4; proteinuric 642.5, 642.6) or ICD-10-CA (non-proteinuric O13; proteinuric O14, O15) discharge diagnosis in any of the 16 fields indicating gestational hypertension.	Average incidence between 1995-2004 = 6.3% (Gestational Hypt)
Qatar	Present study	1,608	Preeclampsia (proteinuria and increased blood pressure after 20 weeks of gestation), gestational hypertension (140/90 mmHg)	Qatari: 9.1% Other Arab: 8.3%

in the current study, family history of diabetes, hypertension, Down's syndrome and consanguinity were not found to have significant associations with PIH at the multiple regression level.

In contrast to other studies [34, 35], having a previous abortion was not found to be protective, but rather increased the risk of developing PIH by 60% in our study. In addition, a more recent cohort study has found that a previous abortion was only protective for preeclampsia if they conceived with the same partner; this protective effect disappeared if they conceived with a different partner [36]. The discrepancy found between our study and those in the international literature may be due to the fact that our study included both gestational hypertension and preeclampsia patients as PIH rather than merely measuring for preeclampsia separately; indeed it has been suggested that these two conditions may have different etiologies, hence the difference in findings [37].

The fact that antenatal care was found to be protective indicates the importance of focusing efforts on this preventative factor. Indeed a study conducted in the US [38] found that Black women had worse outcomes than White women in relation to PIH as they were less likely to begin prenatal care in the first trimester of pregnancy and were less likely to receive adequate care. Similarly, a number of Dutch studies [7, 39] have noted that a number of maternal and neonatal deaths, which were a caused by hypertensive disorders of pregnancy, could have been prevented had more adequate care been taken by medical staff and had there been increased attendance to antenatal care. While the care provided in Qatar is universal, more public awareness campaigns are needed to encourage pregnant women to utilize these services early in their pregnancies.

Conclusion

In conclusion, Qatar has a high prevalence of PIH compared to both regional and global rates. Maternal age > 30, increased BMI, previous abortion, lack of antenatal care, and physical activity were found to be significantly associated with increased risk of PIH in Arab women and could be potentially modifiable risk factors.

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