ORIGINAL ARTICLE

Does Lifestyle Increase the Incidence of Pregnancy-Induced Hypertension?

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Summary

A case-control study was carried out in Alor Gajah to determine the association of socio-economic, dietary and lifestyle factors and the occurrence of pregnancy-induced hypertension. There were a total of 30 cases who were selected from antenatal mothers attending 3 selected health centers in 1998. The control group consisted of 30 antenatal mothers who were matched according to health centre, race and age. The results showed that pregnancy-induced hypertension was significantly associated with obesity ($P<0.05$) and being a housewife ($P < 0.05$).

Key Words: Pregnancy-induced hypertension, Risk factors, Alor Gajah

Introduction

Pregnancy-induced hypertension (PIH) is one of the most common causes of maternal mortality around the world whereby it contributed up to 8% of all maternal deaths[1]. Pregnancy induced hypertension here is defined as a diastolic blood pressure of equivalent or more than 90 mm Hg on two or more consecutive occasions 4 hours apart; or a diastolic blood pressure of equivalent or more than 110 mm Hg on any one occasion beginning at 20 weeks of gestation or more[2].

The aetiology of PIH is still unclear; however, various theories relating to dietary factor, immune system, vascular system and genetics have been tied with the formulation of the condition in a pregnant mother. Generally there have been various studies made on the association of certain risk factors with the development of PIH amongst pregnant mothers; however there were various interpretations on these risk factors. For instance, it was noted that diet which are low in salt content do not have a significant effect in lowering diastolic blood pressure amongst pregnant women[3,4,5]. Another study noted that in fact salt restriction could actually worsen PIH amongst pregnant mothers[6].

With that in mind, a study was set up to determine the association of factors such as demographic, socio-economic, lifestyle and dietary factors amongst pregnant mothers attending antenatal clinic in Alor Gajah, Melaka. Some of these factors especially pertaining to lifestyle was hypothesized as having significant roles in the development of pregnancy induced hypertension amongst pregnant mothers.

Materials and Methods

This was a case-control study involving cases of PIH which were matched with a control group consisting of non cases attending antenatal clinic in the three selected health centres in the district of Alor Gajah, Melaka.

Prior to the study, the sample size was initially calculated. As there were insufficient data on prevalence of exposure factor (for example, obesity) with outcome

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(PIH) and non-outcome (antenatal mothers without PIH) especially in the local scene, *secondary data* were initially collected by going through all active maternal health records from 2 health centres namely Klinik Kesihatan Simpang Ampat and Klinik Kesihatan Machap Baru in the early part of August 1998.

The maternal health records revealed a total of 11 PIH cases (definition as given above), with 4 noted to be obese in their first antenatal visit (body mass index of 30 and above) and a total of 46 non PIH antenatal mothers with 2 obese. Using 80% power (1-β) and a 5% significance level (α) and with a prevalence of 36% (4 out of 11) of exposure factor (obesity) amongst patients with PIH as compared to 4% amongst non-PIH, a sample size of 30 was required for each group by calculating with the EPI-INFO 6 software. The study which took place from September till October 1998 at the three selected health centres was designed to stop when a sample size of above 30 for both case and control was reached. All registered antenatal mothers during that period who fulfilled the criteria of having diastolic blood pressure equal or exceeding 90 mm Hg on 2 occasions at least 4 hours apart beginning at 20 weeks of gestation or more were regarded as having PIH.

The control group which comprised of 30 antenatal mothers were selected as long as they do not fulfill the above criteria for the case group. In addition each of the antenatal mother in the control group was matched to an antenatal mother with PIH with a one to one ratio and according to the following criteria - the same health centre as the case group, the same race and an age difference of about plus minus 5 years.

Data Collection

A questionnaire was prepared and consisted of demographic, socio-economic, dietary and lifestyle variables. Twelve staff nurses helped out in the study at the three selected health centres in Alor Gajah namely Klinik Kesihatan Kuala Sungai Baru, Klinik Kesihatan Durian Tunggal and Klinik Kesihatan Lubok Cina.

In setting up the study, certain variables were defined. Anthropometric measurements of weights and heights were taken at 18 weeks of gestation or less.

Results

Altogether there were 32 antenatal mothers in the case group with 2 declining to be part of the study giving a drop out rate of 6.3%. There were 3 who rejected to be part of the study of the 33 antenatal mothers who fulfilled the criteria of being included in the control group, giving a drop out rate of 9.1%.

The Malays form the majority of both cases (76.6% of cases) and controls (83.3% of controls). Baseline characteristics as relating to age were comparable in both groups (Table I).

Relationship of Risk Factors with Pregnancy-Induced Hypertension

Socio-economic status

Overall, there was no difference in monthly income, monthly grocery bills nor type of housing between the case and control group (P value > 0.05; Table I and II).

In terms of education, the lack of secondary education and beyond amongst respondents also showed no association with neither the case nor the control group (P value = 0.165; Table II).

Occupation

There is a 9 times likelihood of having PIH amongst pregnant mothers who are housewives as compared to working mothers (OR = 9.33; P value = 0.022; Table II).

Family history

Having family history of either cardiovascular disease or diabetes showed no association with the development of PIH (P value > 0.05; Table II).

Table I : Comparison of characteristics via quantitative analysis amongst cases (PIH) and controls (NPIH)

Independent Variables	Cases Mean (SD)	Controls Mean (SD)	Student t test	95% Confidence Interval	P value
Demographic / Socio-economic variables					
Age (years)	33.50 (5.93)	31.63 (6.33)	1.18	1.29 to 5.03	0.243
Income (Ringgit Malaysia)	790.74 (464.51)	1354.16 (1532.46)	-1.82	-1185.32 to 58.46	0.075
Monthly grocery bills (Ringgit Malaysia)	361.07 (165.62)	328.00 (139.88)	0.78	-52.02 to 118.16	0.439
Physiological findings					
Weight (in kg)	71.09 (16.70)	60.13 (16.32)	2.57	2.42 to 19.49	0.013 **
Height (in cm)	1.54 (0.05)	1.53 (0.06)	1.00	-0.02 to 0.03	0.784
Body mass index (kg/meter2)	29.86 (6.68)	25.34 (6.50)	2.65	1.10 to 7.92	0.010**
Haemoglobin level (g/dL)	10.99 (1.43)	11.38 (1.05)	-1.18	-1.03 to 0.2661	0.241
Lifestyle					
Exercise sessions per week	0.71 (1.62)	0.80 (1.34)	-0.22	-0.85 to 0.68	0.830
Number of cigarettes smoked by husband per day	6.34 (7.51)	5.60 (8.26)	0.35	-3.45 to 4.92	0.726

Significance level set at 0.05.

Table II : Comparison of characteristics via qualitative analysis amongst case (PIH) and control (NPIH)

Independent Variables	Cases (n=30) No. (%)	Controls (n=30) No. (%)	OR (95% C I)	Chi-square	P value
Housewife	28 (93)	18 (60)	9.33 (1.65 to 68.78)	9.31	0.022**
Primary education and below	12 (40)	7 (23)	2.19 (0.63 to 7.80)	1.92	0.165
Familial relationship with husband (cousin)	6 (24)	3 (27)	2.25 (0.43 to 12.97)	*	0.471
Type of housing: Village house	14 (47)	17 (57)	0.66 (0.21 to 2.09)	0.60	0.438
Type of housing: Terrace	11 (37)	12 (40)	0.86 (0.27 to 2.79)	0.07	0.790
Nuclear family	21 (70)	17 (57)	1.78 (0.54 to 5.94)	1.14	0.283
Family history of cardiovascular disease	12 (40)	7 (23)	2.19 (0.63 to 7.80)	1.92	0.165
Family history of diabetes	10 (33)	7 (23)	1.64 (0.46 to 5.96)	0.73	0.391
Use of cooking oil					
Palm oil	25 (83)	24 (80)	1.25 (0.28 to 5.58)	0.11	0.738
Coconut oil	3 (10)	2 (7)	1.55 (0.19 to 14.67)	*	1.000
Corn oil	1 (3)	4 (13)	0.22 (0.01 to 2.39)	*	0.350
Exercise					
Physical activity -any form of exercise	6 (20)	9 (30)	0.58 (0.15 to 2.21)	0.80	0.371
Light exercises	4 (13)	8 (27)	0.42 (0.09 to 1.86)	1.66	0.196

* Fisher's exact test applied as one of the expected cells < 5.
Significance level set at 0.05.

Table III : Comparison of dietary pattern amongst case (PIH) and control (NPIH)

Independent Variables	Cases Mean (SD)	Controls Mean (SD)	Student t test	95% Confidence Interval	P value
Dietary pattern (24 hour recall)					
Rice (plates)	2.05 (0.33)	2.00 (0.26)	0.65	-0.10 to 0.20	0.519
Fish (pieces)	1.76 (0.67)	1.46 (0.97)	1.39	-0.13 to 0.73	0.171
Vegetable (tablespoon)	4.03 (2.51)	4.16 (2.18)	-0.22	-1.34 to 1.08	0.827
Tea (glass)	0.50 (0.82)	0.63 (0.85)	-0.62	-0.56 to 0.29	0.539
Fried rice (plates)	0.13 (0.34)	0.20 (0.40)	-0.68	-0.26 to 0.12	0.497
Fried mee (plates)	0.13 (0.34)	0.20 (0.40)	-0.68	-0.26 to 0.12	0.497
Bread (pieces)	1.43 (1.43)	1.20 (1.58)	0.60	-0.54 to 1.01	0.552
Cow's meat (pieces)	0.03 (0.18)	0.26 (0.73)	-1.68	-0.51 to 0.04	0.099
Chicken's meat (pieces)	0.03 (0.18)	0.16 (0.53)	-1.30	-0.33 to 0.07	0.198
Cake (pieces)	0.40 (1.35)	0.33 (0.88)	0.23	-0.52 to 0.65	0.822
Milo (glass)	0.86 (1.03)	0.53 (0.77)	1.38	-0.15 to 0.81	0.174
Milk (glass)	0.56 (0.89	0.66 (0.92)	-0.43	-0.57 to 0.37	0.672
Dietary pattern (1 week recall - number of servings)					
Cow's meat	0.50 (0.62)	0.80 (0.84)	-1.56	-0.68 to 0.08	0.125
Chicken's meat	1.23 (0.67)	1.63 (1.40)	-1.41	-0.96 to 0.16	0.165
Egg	2.43 (1.97)	2.46 (1.63)	-0.07	-0.97 to 0.90	0.944
Salted fish	0.53 (1.40)	0.93 (1.79)	-0.96	-1.23 to 0.43	0.342
Margarine	1.63 (2.09)	1.76 (1.450	0.15	-1.06 to 0.79	0.775
Fish	5.76 (2.16)	4.66 (2.49)	1.82	-0.10 to 2.30	0.073
Ajinomoto	3.10 (2.99)	2.13 (3.24)	1.20	-0.64 to 2.58	0.236
Instant mee	0.50 (0.77)	0.40 (1.32)	0.36	-0.46 to 0.66	0.723
Style of servings (Number of servings in a week)					
Steamed	0.70 (1.46)	0.90 (1.37)	-0.55	-0.93 to 0.53	0.588
Boiled	2.56 (2.20)	1.86 (1.79)	1.35	-0.34 to 1.74	0.183
Roasted	1.16 (1.26)	1.13 (1.25)	1.35	-0.61 to 0.68	0.919
Fried	5.73 (2.61)	5.16 (2.05)	0.10	-0.64 to 1.78	0.354

Significance level set at 0.05.

Physiological findings

An obvious difference between the two groups was noted in both weight and body mass index. The case group had a heavier body mass index of mean (SD) 29.86 (6.68) as compared to 25.34 (6.50) in the control group (P value = 0.010; Table I).

Dietary pattern

Overall, there was no difference at all between both groups in terms of the varied food items consumed based on the 24-hour recall and the 1 week recall as shown in Table III. Food items prepared variously by steaming, cooking, roasting and frying did not show any disparity between both groups (P values > 0.05; Table III). There was also no association between the use of cooking oil high in saturated fatty acid such as coconut oil and palm oil in the case and control group (P values > 0.05; Table II).

Exercise

Doing any form of physical activity had no bearing with neither the case nor the control group in terms of the number of sessions of exercise (P values > 0.05; Table I).

Discussion

The study showed an increased association between obesity and having PIH which is consistent with other studies[7]. Since obesity is usually associated with the increased level of both diastolic and systolic blood pressure in essential hypertension, it may play a similar role in PIH.

Being a housewife also greatly increased one's chance of having PIH as demonstrated in this study. In a study it was noted that stress in any working condition when accompanied by lack of control over job pace may lead to the development of PIH[8]. Stress may occur not only at work places but also at the home environment where a housewife would be facing multiple duties such as caring for the other children and other household chores such as cleaning the house and cooking.

In terms of dietary pattern, there appeared to be no association at all between consumption of the varied food items and the development of PIH. Nor was there any association between the way food was cooked and the type of cooking oil used with having the condition. There are studies that have proved inconclusively the association of type of food consumed with PIH. Studies such as salt restriction having no effect at all in lowering PIH have been mentioned earlier. Another study on fish oil supplementation also showed the same results[9]. These food items which may reduce the likelihood of developing essential hypertension seem to have no effect at all in PIH. All this points out to the fact that PIH may not be dietary in causation but may be due to immunological problems arising from the close biological interaction between both mother and fetus[10]. However, one should be careful in interpreting these results as there are also contradictory studies that showed association of certain food items with the development of PIH such as low dietary calcium intake in the development of PIH[11,12]. There are also studies that have implicated magnesium deficiency in the development of PIH[13, 14].

Socio-economic issues and factors which is the core predisposing factor in the development of numerous diseases and conditions such as food-borne diseases, anaemia in pregnancy, high infant mortality to name a few, have no foothold in this study. Factors such as income, educational level, type of housing have been found to have no association with the development of PIH. Lifestyle factors such as exercise was also found to have no role in reducing PIH.

The limitations of this study includes absence of temporal sequence between the independent variables under study and PIH. Other potential bias that needs to be considered would include recall bias especially pertaining to 24 hours recall and 1 week dietary recall. As the result of all these limitations, perhaps it would be prudent to do a prospective study in associating some of the independent variables such as consumption of certain food items with the development of PIH.

In conclusion, it may be noted here that obesity acts as a risk factor in the development of PIH. Perhaps a future mother would be advised to stay within the normal range of weight prior to pregnancy to lessen the risk of developing PIH. The consumption of food items during pregnancy however, do not affect the development of PIH and so advising pregnant mothers to refrain from certain food items may not be necessary.

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