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Complete List of Authors:	Roth, Heike; University of Technology Sydney, Faculty of Health Homer, Caroline; University of Technology Sydney, Centre for Midwifery, Child and Family Health; Burnet Institute, Maternal and Child Health LeMarquand, Grace; University of New South Wales Roberts, Lynne M.; Saint George Hospital, Women's and Children's Health; University of New South Wales, Medicine Hanley, LIsa; Saint George Hospital, Maternity Consumer Brown, Mark; Saint George Hospital, Renal Medicine; University of New South Wales, St George Clinical School Henry, Amanda ; University of New South Wales Faculty of Medicine, Women's and Children's Health
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Assessing Australian women's knowledge and knowledge preferences about long-term health after hypertensive disorders of pregnancy: a survey study

Heike Roth[1], Caroline SE Homer[1,3], Grace LeMarquand[2], Lynne Roberts[2,7], Lisa Hanley[8], Mark Brown[5,6], Amanda Henry[1,2,4,7]

[1]Faculty of Health, University of Technology Sydney, Sydney, NSW, Australia [2]School of Women's and Children's Health, UNSW Medicine, University of NSW, Sydney, NSW, Australia [3]Burnet Institute, Maternal, Child and Adolescent Health, Melbourne, Victoria, Australia [4]The George Institute, Sydney, NSW, Australia [5]Dept. Renal Medicine, St George Hospital, Sydney, NSW, Australia, [6]St George & Sutherland Clinical School, UNSW, Sydney, NSW, Australia, [7]Dept. Women's and Children's Health, St George Hospital, Sydney, NSW, Australia, [8]Consumer, Sydney, Australia.

Corresponding author: Heike Roth

Email: heike.roth@student.uts.edu.au,

Address: c/o Dr Amanda Henry, St George Hospital, Department of Women's and Children's Health, Kogarah NSW 2217, Australia.

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ABSTRACT

Objective(s): To (a) assess women's current knowledge regarding long-term cardiovascular health after hypertensive disorders of pregnancy (b) elicit women's preferred educational content and format regarding health after hypertensive disorders of pregnancy.

Design and setting: A custom-created online survey exploring Australian women's knowledge about long-term health after hypertensive disorders of pregnancy, distributed through consumer groups and social media.

Participants: 266 women with (n=174) or without (n=92) a history of hypertensive disorders of pregnancy.

Primary and secondary outcome measures: 1) Proportion of women identifying long-term health risks after hypertensive disorder of pregnancy using a 10-point risk knowledge score with 0-4 'low', 4.1-7.0 'moderate' and 7.1-10 'high'. 2) Exploration of preferred content, format and distribution of educational material post hypertensive disorder of pregnancy.

Results: Knowledge scores about health after hypertensive disorder of pregnancy were moderate in groups with and without a history of the disorder. Knowledge was highest regarding risk of recurrent hypertensive disorders in a subsequent pregnancy, 'moderate' for chronic hypertension and heart attack, 'moderate' and 'low' regarding risk of heart disease and 'low' for diabetes and renal disease. Only 36% of all participants were aware that risks start within 10 years after the affected pregnancy. The majority of respondents with a history of hypertensive disorder of pregnancy (76%) preferred receiving information about long-term health 0-6 months postpartum from a healthcare

provider (80%), key organisations (60%), social media (47%) and brochures/flyers (43%).

Conclusion(s): Women's knowledge regarding health risks after hypertensive disorder of pregnancy was 'moderate', although with important disease-specific gaps such as increased risk of diabetes. Most women wanted to be informed about their long-term health from a healthcare provider.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- Consumer co-created survey exploring health knowledge after hypertensive pregnancy.
- For the first time survey results include findings from women with a history of gestational hypertension as well as from women without a history of hypertensive disorder of pregnancy.
- Recruitment from groups with potentially greater baseline knowledge may bias results, although substantive knowledge gaps still found.
- Although surveys were available in English, Arabic and Mandarin, there remains potential sub-optimal coverage of culturally and linguistically diverse groups.

INTRODUCTION

Hypertensive disorders of pregnancy (HDP) include chronic hypertension (CH), preeclampsia (PE) and gestational hypertension (GH) and complicate 5-10% of pregnancies[1]. PE is a multi-system disorder characterised by new-onset hypertension after 20 weeks' gestation and involvement of one or more other organ systems and/or the fetus[2 3]. GH is new-onset hypertension after 20

weeks' gestation without any other complications, and apart from increased risk of progression to PE[2 3], is not associated with adverse pregnancy outcomes. However, both conditions are associated with long-term cardiovascular sequelae[4 5]. CH is defined as hypertension that is confirmed before pregnancy or before 20 completed weeks gestation, which may worsen during pregnancy and/or on which preeclampsia may be superimposed[2] . Globally, cardiovascular disease (CVD) is one of the leading causes of death in women,[6] and for women who have experienced an HDP, it is 2-3 times higher compared with those who did not[4 7 8]. This risk of premature death is present within 10 years after the affected pregnancy[7 9 10] and remains after adjusting for the presence of other cardiovascular risk factors.

Both Australian and international societies, including the Society of Obstetric Medicine of Australia and New Zealand (SOMANZ) and the International Society for the Study of Hypertension in Pregnancy (ISSHP), recommend that women and healthcare providers (HCP) are provided with information about HDP and later CVD[2 3]. This includes recommending that women have a clinical review several months postpartum, and regular general practitioner (GP) follow-up to monitor blood pressure, fasting lipids and blood sugar[2]. Adopting a healthy lifestyle with maintenance of an ideal weight and regular aerobic exercise is emphasised[2 3]. The aims of this study were to (a) explore Australian women's current knowledge on the topic of long-term CVD health after any HDP, not just PE (b) elicit women's preferred educational content and format regarding health after HDP, as a basis for creating tailored information and health advice for women after HDP.

METHOD

A national survey of women with and without a history of HDP was conducted, using a custom-created, face-validated online survey. Ethical approval was provided by the relevant Human Research Ethics Committee (HREC 18/POWH/326, REGIS 2019/PID05668).

Patient and Public involvement

As a validated instrument to assess women's knowledge was unavailable, a survey was custom designed. Initially, women with a history of HDP, comprising nine volunteers from the *Postpartum physiology, psychology and paediatric follow up study (P4 Study)*[11] and Australian Action on Preeclampsia (AAPEC), were invited to take part in group interviews which addressed the possible content and design of the survey, tested the survey for face validity and provided feedback for improvement. The topics discussed during the interviews were sourced from findings from a scoping literature review[12] and further complemented by questions specifically exploring the Australian context for women experiencing HDP. Following feedback, the survey was modified. The survey was made available in English, Arabic and Mandarin.

Data collection

The final survey was targeted at women in Australia, 18 years and older with a history of pregnancy in the last 3 years. The online survey, using SurveyMonkey™, was open from July to August 2019. Survey distribution occurred through the P4 study participants, organisations such as AAPEC,

maternity consumer groups as well as via the project's consumer representative and social media (Facebook and Twitter) including multicultural networks in order to reach Arabic and Mandarin speaking communities.

The data collection instrument

The survey for women (Appendix 1) explored demographic details, assessed obstetric history, history of HDP and other medical history including family history. The survey was tailored to women's self-reported HDP history (GH, PE, CH with or without worsening in pregnancy or superimposed PE, no hypertension history), with women given definitions of HDP conditions early in the survey to aid their self-report. Questions focused on knowledge of risk after pregnancy, provision of care and education following birth and what information and education women would like to receive. Women with a history of HDP were asked to classify their risk of various long-term health outcomes as greater, less than or equal to that of a woman with a normotensive pregnancy. Women after normotensive pregnancy were also asked to classify whether they believed women who had had HDP were at greater, lesser, or equal risk. The survey included two 'distractor' conditions not known to have an increased risk after HDP (breast cancer and seizures) to elicit negative answers and ascertain whether women could identify what they were not at increased risk of after HDP as well as what they were at risk of. At survey completion, women were provided with a correct risk profile summary and a link to further information.

Data Analysis

Quantitative survey analysis was undertaken using SPSS Version 25 (SPSS Statistics for Windows, Armonk, NY). Demographic data and responses to individual questions were analysed descriptively. To examine difference in knowledge levels amongst the targeted subgroups, (GH, PE, CH in pregnancy, no hypertension history) responses regarding HDP and future health risks were compared using Chi-squared testing or likelihood ratio for categorical data (as appropriate to subgroup sample size) and one-way ANOVA testing for continuous data. A p value of <0.05 was considered statistically significant.

A knowledge score was created for the risk matrix, whereby 1 point was allocated to the correct answer, 0 for the incorrect answer, 0 for 'I do not know' and 0 for no answer/left blank. A mean score for each risk factor was calculated and a scale of 'low', 'moderate' and 'high' knowledge was established. The ranking classifications were divided into three score categories. For individual risk mean scores, 'low knowledge' equated to a mean of 0.00-0.40, 'moderate knowledge' was 0.41-0.70 and 'high knowledge' a mean of 0.71-1.00. An overall mean score out of 10 (as there were 10 conditions) was given for the HDP and non-HDP groups and were classified as 'low' 'moderate' or 'high' using the same mean ranges as were used for the individual conditions. Categorical analysis for proportions of each knowledge group ('high', 'moderate' and 'low') was also conducted to provide a further perspective.

RESULTS

In total, 308 survey responses were received (Figure 1). Forty-two were excluded: 40 for discontinuing the survey and not answering the question

asking about their perception of lower/same/higher risk with regards to 10 health conditions, and two with 'CH only' (no worsening hypertension or superimposed PE in pregnancy). Of 266 included responses, 174 (65%) women had a history of any HDP (HDP group) and 92 (35%) did not (non-HDP group). The HDP group consisted of 15 women with GH only (9%), 143 women with PE only (82%) and 16 women with CH plus superimposed pregnancy hypertension or PE (9%; will be known as CH). Of the HDP group, 123 (71%) had their most recent experience with HDP less than three years prior (32% <1 year prior and 39% 1-3 years prior).

Most respondents were in the 26-35 or 36-45 year age groups (91%), 89% were of Caucasian ethnicity, 90% pursued education beyond secondary school and 96% were in a relationship (Table 1). HDP women were more likely to be Caucasian, to have a history of diabetes, renal problems, be overweight and to have at least one additional cardiovascular risk factor than non-HDP women (Supplementary Table 1), and less likely to be university-educated. Half of all participants were sourced through social media (50%), with most of the remainder (45%) recruited via the P4 study (8% of HDP women, 46% of non-HDP women) and AAPEC (35% of HDP women).

Table 1: Respondent demographics

	GH	PE	CH	Total HDP	Non HDP	Total	P
	n=15	n=143	n=16	n=174	n=92	n=266	HDP vs non-HDP
	n (%)*	n (%)*	n (%)*	n (%)*	n (%)*	n (%)*	
AGE							
18-25	2 (13)	8 (6)	0 (0)	10 (6)	2 (2)	12 (5)	0.157
26-35	5 (33)	68 (48)	8 (50)	81 (47)	36 (39)	117 (44)	0.246
36-45	8 (53)	60 (42)	8 (50)	76 (44)	50 (54)	126 (47)	0.097

45+	0 (0)	7 (5)	0 (0)	7 (4)	3 (3)	10 (3)	0.753
prefer not to answer	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	1 (0)	-
TOTAL	15 (100)	143 (101)	16 (100)	174 (101)	92 (99)	266 (99)	
ETHNICITY							
Caucasian	14 (93)	138 (97)	13 (81)	165 (95)	71 (77)	236 (89)	<0.001
Asian	1 (7)	3 (2)	1 (6)	5 (3)	18 (20)	23 (9)	<0.001
Other[1]	0 (0)	2 (1)	2 (13)	4 (2)	3 (8)	7 (3)	0.646
TOTAL	15 (100)	143 (100)	16 (100)	174(100)	92 (100)	266 (101)	
HIGHEST EDUCATIONAL ATTAINMENT							
Secondary School	1 (7)	20 (14)	2 (13)	23 (13)	2 (2)	25 (9)	0.003
Diploma/Trade Certificate	5 (33)	47 (33)	8 (50)	60 (35)	9 (10)	69 (26)	<0.001
University Degree	9 (60)	75 (52)	6 (38)	90 (52)	81 (88)	171 (64)	<0.001
Prefer not to answer	0 (0)	1 (1)	0 (0)	1 (1)	0 (0)	1 (0)	-
TOTAL	15 (100)	143 (100)	16 (101)	174 (101)	92 (100)	266 (99)	
RELATIONSHIP STATUS							
In a relationship	15 (100)	133 (93)	14 (88)	162 (93)	92 (100)	254 (96)	0.001
Not in a relationship	0 (0)	9 (6)	2 (13)	11 (6)	0 (1)	11 (4)	
Prefer not to answer	0 (0)	1 (1)	0 (0)	1 (1)	0 (0)	1 (0)	-
TOTAL	15 (100)	143 (100)	16 (101)	174 (100)	92 (100)	266 (100)	
RECRUITED TO SURVEY VIA							
P4 Newsletter	2 (13)	11 (8)	1 (6)	14 (8)	42 (46)	56 (21)	<0.001
AAPEC	1 (7)	57 (40)	3 (19)	61 (35)	1 (1)	62 (23)	<0.001
Social Media	12 (80)	74 (52)	11 (69)	97 (56)	37 (40)	134 (50)	0.016
Other [2]	0 (0)	1 (1)	1 (6)	2 (1)	12 (13)	14 (5)	<0.001
TOTAL	15 (100)	143 (101)	16 (100)	174 (100)	92 (100)	266 (99)	

* Percentages may not add to 100% as figures are rounded to whole numbers only

[1] Other: Indigenous Australian (n=1), Polynesian or Maori (n=2), mixed ethnicity (n=4).

[2] Other: Friend (n=11), ACM (n=1), Clinic (n=1), Maternity Consumer group other than AAPEC (n=1).

PE = preeclampsia GH = gestational hypertension CH = chronic hypertension, worsening in pregnancy and/or superimposed preeclampsia P4= Postpartum Physiology, Psychology, and Paediatric Study AAPEC= Australian Action on Preeclampsia ACM= Australian College of Midwives.

Table 2: Means of risk factor knowledge of women

	GH	PE	CH	P HDP GH vs PE vs CH	P GH vs PE	P CH vs PE		HDP	Non-HDP	P HDP vs non-HDP
	n=15	n=143	n=16					n=174	n=92	
Chronic Hypertension	0.53	0.78	0.81	0.10	0.10	0.49		0.76	0.62	0.023
Diabetes	0.27	0.24	0.31	0.84	0.72	0.30		0.25	0.35	0.115
Renal Disease	0.27	0.54	0.69	0.06	0.044	0.25		0.53	0.21	<0.001
Heart Attack	0.53	0.69	0.75	0.40	0.14	0.23		0.68	0.52	0.014

Repeat HDP	0.87	0.90	0.94	0.81	0.52	0.27	0.90	0.71	<0.001
Stroke	0.47	0.62	0.81	0.14	0.37	0.10	0.63	0.53	0.144
Heart Disease	0.47	0.69	0.75	0.17	0.12	0.29	0.68	0.50	0.005
PVD	0.33	0.50	0.50	0.46	0.42	0.98	0.32	0.45	<0.001
Breast Cancer*	0.20	0.52	0.31	0.026	0.013	0.12	0.47	0.65	0.004
Seizures*	0.27	0.29	0.13	0.39	0.74	0.10	0.27	0.44	0.009
OVERALL MEAN KNOWLEDGE SCORE (OUT OF 10)	**4.2**	**5.8**	**6.0**	0.09	0.19	0.80	**5.6**	**5.2**	0.21

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy, PVD= Peripheral Vascular Disease

* Breast cancer and seizures are distractors within the survey. These were included despite being conditions that women after HDP are not at greater risk of.

The colour coding in addition to the mean scores aims to highlight the areas of 'low' (red), 'moderate' (orange) and 'high' (green) knowledge.

MEAN SCORE		
	LOW	0-0.40
	MODERATE	0.41-0.70
	HIGH	0.71-1

Average knowledge scores are shown in Table 2 and detailed results on which these scores are based on are shown in Supplementary Tables 2-11. Overall knowledge of the 10 conditions in the survey was 'moderate' for both groups (5.6/10 amongst HDP and 5.2/10 amongst non-HDP, p=0.21), with 33% in both groups having "high" overall knowledge, 32% and 40% respectively having "low" overall knowledge (Supplementary Table 12). Women with a history of HDP had 'high' knowledge with regards to HDP recurrence in a subsequent pregnancy (0.90) and CH (0.76); and 'moderate' knowledge regarding HDP's increased chance of conditions such as heart attack (0.68), heart disease (0.68) and stroke (0.63). Women without HDP history had 'high' knowledge (0.71) for HDP recurrence in a subsequent pregnancy. The same group of women had moderate knowledge of chronic hypertension (0.62) and stroke (0.53). Lowest knowledge across both groups was around the risk of future diabetes (0.25

HDP group and 0.35 for non-HDP group). Further 'low' scoring conditions were peripheral vascular disease (PVD) and renal disease. HDP women for most conditions had significantly higher knowledge than the non-HDP group, however the non-HDP group were more likely to correctly identify that there is not an increased risk of the two 'distractor' conditions after HDP.

Table 3 shows knowledge score breakdown by recency of pregnancy. In the subgroup of HDP women who experienced PE (n=143), average knowledge was similar amongst women who experienced HDP within the last three years (5.8/10), compared to those who experienced HDP more than three years ago (5.7/10).

Table 3: Means of risk factor knowledge of women with a history of preeclampsia listed by time elapsed since HDP

	PE n=143		PE n=143						PE n=143		
	ALL COMBINED		0 month- 6 month	6 month - 12 month	1-2 years	2-3 years	>3 years	P	UNDER 3	OVER 3	P
			n=26	n=19	n=32	n=20	n=46	between groups	n=97	n=46	Under 3 yrs vs over 3 yrs
Chronic Hypertension	0.78		0.77	0.89	0.78	0.80	0.72	0.648	0.80	0.72	0.272
Diabetes	0.24		0.23	0.42	0.31	0.10	0.20	0.144	0.27	0.20	0.350
Renal Disease	0.54		0.50	0.74	0.41	0.65	0.52	0.169	0.55	0.52	0.784
Heart Attack	0.69		0.58	0.89	0.66	0.70	0.67	0.248	0.69	0.67	0.841
Repeat HDP	0.90		0.88	0.89	0.94	0.95	0.85	0.675	0.92	0.85	0.253
Stroke	0.62		0.65	0.68	0.50	0.65	0.65	0.619	0.61	0.65	0.616

Heart Disease	0.69		0.62	0.79	0.63	0.65	0.76	0.498		0.66	0.76	0.209
PVD	0.50		0.54	0.53	0.53	0.40	0.50	0.895		0.51	0.50	0.954
Breast Cancer*	0.52		0.46	0.37	0.63	0.40	0.59	0.245		0.48	0.59	0.255
Seizures*	0.29		0.15	0.16	0.41	0.45	0.26	0.066		0.30	0.26	0.641
OVERALL MEAN KNOWLEDGE SCORE OUT OF 10	**5.8**		**5.4**	**6.4**	**5.8**	**5.8**	**5.7**	0.825		**5.8**	**5.7**	0.890

The colour coding in addition to the mean scores aims to highlight the areas of 'low' (red), 'moderate' (orange) and 'high' (green) knowledge.

MEAN SCORE	
LOW	0-0.40
MODERATE	0.41-0.70
HIGH	0.71-1

Of the HDP women, only 32% were aware that the cardiovascular conditions may start manifesting within 10 years after an affected pregnancy, compared with 45% of women in the non-HDP group (p=0.036). About a third in each group (30% HDP, 36% non-HDP) were unsure about timing of risk rise/when health conditions manifest (Supplementary Table 13).

Women with HDP history were asked about their personal experience of risk discussion with healthcare providers (Table 4). The most frequent discussions about future health were regarding HDP in subsequent pregnancies (45%), risk of chronic hypertension (43%), and 'No discussion' (37%). Risk discussions were no more likely to have occurred in women with HDP less than 3 years ago or over 3 years ago.

Table 4: Proportion of conditions discussed when addressing future risk (multiple answers collected) within and over 3 years since last HDP

	GH n=15	**PE n=143**	**CH n=16**	**TOTAL n=174**	**OVERALL TOTAL n=174**	**P < vs > 3 yrs since**

	<3 yrs n=13 n (%)	>3 yrs n=2 n (%)	<3 yrs n=97 n (%)	>3 yrs n=46 n (%)	<3 yrs n=13 n (%)	>3 yrs n=3 n (%)	<3 yrs n=123 n (%)	>3 yrs n=51 n (%)	n (%)	HDP
HDP next pregnancy	3 (23)	1 (50)	47 (48)	21 (46)	5 (38)	2 (67)	55 (45)	24 (47)	79 (45)	0.777
Chronic Hypertension	4 (31)	1 (50)	47 (48)	16 (35)	4 (31)	2 (67)	55 (45)	19 (37)	74 (43)	0.365
No discussion	**7 (54)**	**1 (50)**	**33 (34)**	**17 (37)**	**5 (38)**	**1 (33)**	**45 (37)**	**19 (37)**	**64 (37)**	**0.934**
Lifestyle changes	4 (31)	0 (0)	26 (27)	6 (13)	2 (15)	2 (67)	32 (26)	8 (16)	40 (23)	0.140
Heart Attack	1 (8)	0 (0)	20 (21)	6 (13)	1 (8)	1 (33)	22 (18)	7 (14)	29 (17)	0.503
Renal Disease	1 (8)	0 (0)	20 (21)	3 (7)	2 (15)	1 (33)	23 (19)	4 (8)	27 (16)	0.072
Stroke	1 (8)	1 (50)	18 (19)	4 (9)	1 (8)	1 (33)	20 (16)	6 (12)	26 (15)	0.449
Peripheral vascular disease	0 (0)	0 (0)	15 15)	5 (11)	1 (8)	0 (0)	16 (13)	5 (10)	21 (12)	0.555
Cannot remember	1 (8)	0 (0)	4 (4)	2 (4)	1 (8)	0 (0)	6 (5)	2 (4)	8 (5)	0.781

*Table represents frequency of each option; percentages add to over 100% as women were asked to select any/all that applied. PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

When asked about preferences of the timing of a future risk discussion, the majority (76%) of women wanted a discussion 0-6 months postpartum. The topics women most wished to discuss (Table 5) are 'impact on my children from the pregnancy affected by HDP' (73%), 'signs and symptoms of the conditions' (67%), 'when does risk rise' (54%) and 'risk reduction for subsequent pregnancy' (54%). Women's preference for receiving information on long-term health after HDP is via a medical professional (80%), through key organisations (60%) and social media (47%).

Table 5: HDP women's preferences for content and distribution of information/education on future risk after HDP (multiple answers collected) in order of preference

	GH	PE	CH	Total HDP
	n=15	n=143	n=16	n=174
	n (%)*	n (%)*	n (%)*	n (%)*

PREFERENCE OF DISCUSSION TOPICS				
Impact on my children from the pregnancy affected by HDP	11 (73)	115 (80)	10 (63)	136 (73)
Signs and Symptoms of the conditions	12 (80)	101 (71)	11 (69)	124 (67)
Risk reduction for subsequent pregnancy	6 (40)	88 (62)	7 (44)	101 (54)
When does the risk rise	6 (40)	87 (61)	8 (50)	101 (54)
Statistics	6 (40)	86 (60)	6 (38)	98 (53)
Reducing risk behaviours (diet, exercise, smoking cessation)	6 (40)	80 (56)	5 (31)	91 (49)
Where to find information	6 (40)	73 (51)	2 (13)	81 (44)
How to discuss the matter with my Healthcare provider	4 (27)	57 (40)	4 (25)	65 (35)
PREFERENCE OF DISTRIBUTION				
Medical professionals	11 (73)	117 (82)	12 (75)	140 (80)
Key organisations	8 (53)	87 (61)	10 (63)	105 (60)
Social Media	6 (40)	73 (51)	3 (19)	82 (47)
Brochures/Flyers	6 (40)	64 (45)	5 (31)	75 (43)
Online Videos	3 (20)	35 (24)	4 (25)	42 (24)
Podcast/Media	2 (13)	33 (23)	4 (25)	39 (22)

*Table represents frequency of each option; percentages add to over 100% as women were asked to select any/all that applied. PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

DISCUSSION

This study found overall, 'moderate' knowledge of health conditions after HDP amongst both HDP and non-HDP women. Amongst women with a history of HDP, highest knowledge was identified with regards to future risk of hypertension and repeat HDP in subsequent pregnancies. Conversely, knowledge of future risk of diabetes was low, as was knowledge of the "distractor" conditions among HDP women particularly. Diabetes as a future risk factor post HDP has previously not been reported on in studies of women's knowledge, and our findings suggest this is an important knowledge gap to address.

Other novel aspects of our study are inclusion of women who had a history of GH as well as those with a history of PE, and assessing knowledge of non-HDP

women's knowledge. Women after HDP had somewhat higher knowledge of most health risks than the non-HDP group, however non-HDP group also had better knowledge of some aspects such as timing of risk increase. However, both groups' knowledge of the early increase in risk was low, adding further concern and reason to address the knowledge gap. When looking at the proportion of participants scoring "high", these were equal between the HDP (33%) and non-HDP groups (33%), whilst proportions scoring "low" were similar enough (32% HDP versus 40% non-HDP) to not to show statistical significance. This further highlights that the HDP group remain underinformed about their increased CVD risk.

A further important finding was that many HDP women were not made aware of future health risks, with 37% of HDP women reporting to have had 'no discussion' about their increased long-term risk. Concerningly, women with more recent HDP were no more likely than women with HDP>3 years ago to report having risks discussed. This finding suggests risk discussions may not have improved in recent years despite updated guidelines emphasising long-term health[2 3], and that the extensive evidence regarding long-term implications for women after HDP continues to be lost in the translation of research to practice.

Women's knowledge after GH has not been previously reported as far as we are aware even though GH has similar frequency and similar future CVD risk as PE[4 13]. Although only 9% of our sample were GH, this group had somewhat lower knowledge than the PE and CH groups regarding conditions after HDP

(although mostly not reaching statistical significance). Over half reported receiving no discussion of health risks after GH. This suggests substantive knowledge gaps after GH to address in both women and healthcare providers.

International studies exploring women's knowledge have predominantly reported limited or no knowledge about the link between HDP and CVD[12], though our study found overall, 'moderate' knowledge of health conditions after HDP. The two conditions associated with highest knowledge were repeat HDP and risk of future hypertension. Findings were similar in Traylor et al.'s[14] survey where 146 women post HDP were included (PE n=76, PE with severe features n=41, CH=29). Future hypertension and repeat HDP were correctly identified by women as risk factors, however this knowledge was mainly reflected in the group of women who had experienced PE with severe features. Brown et al.[15] (n=12 women attending postnatal follow-up clinic) also found that women are aware of repeat HDP risks, however despite postnatal risk counseling, perception of hypertension and CVD risk was mainly associated with participants who had a family history of CVD. More recently, Hutchesson et al.[16] surveyed 127 women with PE in the two years prior, finding very high knowledge about future hypertension risk (96%, higher than our post-PE findings) and most were aware of stroke (67%) and CVD (66%) risks (similar to our findings). Over a third of women after PE had 'no discussion' about future risk in our study. Hutchesson et. al[16] reported over one third of their participants remained unaware of increased CVD risks, which is similar to our findings. Similarities may be explained by the fact that major source of PE participants for both, the Hutchesson et. al[16] survey and ours, was the patient support/advocacy

group AAPEC. Recruitment from this advocacy group may also explain a higher post-PE knowledge than other studies have reported.

Our study findings resonate with those from similarly targeted women in Canada, Portugal, United Kingdom, the United States of America and a previous Australian study, all conducted between 2013 and 2017[12]. Therefore, from a global perspective, these findings reinforce a persisting, and concerning, research to consumer gap. With international guidelines, including ISSHP[2], specifically targeted to assist HCPs providing care to women on an international scale to better manage and address health after HDP, this practice gap of knowledge transmission to women would be expected to narrow.

Education preferences

Content

Women mostly wanted educational materials to address HDP impact on their children, signs and symptoms of conditions they are at higher risk of, the timing of when their risks rise, and how to best reduce risk of recurrent HDP. Similar preferences were expressed by the women included in Seely et al.'s[17] focus group of 20 women after PE, with the key concern being the impact the PE pregnancy may have had on the health of their children.

Format of education and access

Our study identified that women mostly wanted to receive information about long-term health after HDP from medical professionals. Key organisations who are experts on the topic, via social media and through information brochures

were other acceptable avenues of access to information. This is in contrast to Skurnik et al's[18] focus group of 14 women after PE, whose preferences for educational materials about the link between CVD and PE were via pamphlets available in doctor's offices as well as via online communities and topical blogs. However, Hird et al's[19] participants also expressed preference for healthcare providers as their information source, including wanting healthcare providers to guide them towards reliable online/external information sources rather than encounter irrelevant or potentially inaccurate information due to their self-initiated search. Hutchesson et al.[16] report that high knowledge amongst participants was mainly due to the women's own research rather than receiving all possible, relevant information from their healthcare provider. Overall, existing studies including ours would suggest that although women are very open to the use of online sources or information packs, their healthcare providers are seen as central to closing their knowledge gaps.

Time of risk discussion

An important element to consider when communicating about risk with women who have experienced GH or PE is the timing of these discussions, as situational factors of being a new mother may alter when women are most receptive to follow-up. In our study, three-quarters of the women preferred this to occur in the first six months after birth. As well as being their preference, this also aligns with the potential benefits of early intervention, and would allow for addressing knowledge gaps found in this study around how soon the risk rises after HDP. Addressing future risk early but not immediately is also supported by Brown et al.'s study of women after PE, where participants suggested that six

months postpartum was the timeframe where they felt they had transitioned into a more comfortable stage of parenting and were able to focus more on themselves again[15].

Strengths and limitations

The survey was co-created via a formalised process of seeking input and feedback on the usability, language and content from women who have previously experienced HDP. This creation and face validation process involving consumers gives added value to the survey.

Our knowledge score is both a strength, as it allows for a summary of findings across all the conditions and risks, and a limitation, as assigning cut-points for knowledge ranking is an arbitrary designation. Having included the distractor conditions (breast cancer and seizures) may also have altered the overall score. However, we believe it is important for women to not incorrectly believe they are at increased risk of more conditions than they are, as well as having knowledge of their increased cardiovascular risk. The addition of women with a history of GH as well as women without any history of HDP, is also a strength to add broader perspective on this topic.

Limitations include demographic make-up of respondents, with HDP participants predominantly English speaking and Caucasian (95%) despite the survey being available in Arabic and Mandarin as well as English. The non-HDP group (20% Asian background) had similar background demographics of Australian reproductive-aged women[20], and as HDP is more prevalent amongst

the Caucasian population[21], the sample actually is likely close to representative of Australian HDP and non-HDP women. However, it would have been preferable to also gain insight from more culturally and linguistically diverse groups in order to understand their knowledge base and address their needs within this context.

In the survey, women were asked to select their HDP history which was then used to group them for analysis. Women's diagnosis of HDP is by self-report is a limitation, as some bias may be introduced through inaccurate self-report of diagnosis. The broad geographical range and anonymous nature of the survey precluded any verification of diagnosis. However, women were provided with definitions of the various HDP conditions at the start of the survey to aid them in their self-report. Another limitation is where participants were recruited from, with close to half either drawn from the P4 study (an Australian post-HDP research study) or consumer group AAPEC. Therefore, there may be knowledge bias in the sample (i.e. a more knowledgeable group of participants than the overall HDP or non-HDP population). However, as even this group with potentially greater baseline knowledge had substantive knowledge gaps, our study highlights the need for interventions to improve knowledge of health after HDP.

Implications

Close to two decades worth of data have been collected[8] since research on the link between HDP and increased CVD risk emerged in the early 2000s, with the first systematic review published in 2007[22]. It could be expected that this

knowledge, by now, would have been translated into practice and shared with HDP women, however our findings suggest that this is still not the case. This study is valuable from the public health perspective, given the wider context of prevalence and importance of cardiovascular disease in women.

Guidelines such as ISSHP[2] and SOMANZ[3] suggest regular follow-up after HDP as well as counselling women with regards to their individual long-term CVD risk. Although available to the public, these are not designed for women. Compiling suitable information for women would be an important step towards closing the knowledge gap. It is important to establish preferred content, presentation and timing of education for post-HDP health for women as we have in this study, to maximise the chance that women will engage with and benefit from education.

CONCLUSION

This Australian survey of women's knowledge of risks after HDP, found varying knowledge from the targeted groups. Despite 'high' knowledge being demonstrated regarding some risks, overall significant knowledge gaps were identified for certain conditions, particularly diabetes, and for knowledge about the relatively early timing of when health risks increase after HDP. Identifying these gaps are important in planning tailored education for women, and to improve early intervention for modifiable CVD risks in women after HDP. Addressing these women's preferences for content and to have this delivered by their healthcare provider may further lead to enhanced counselling, management and improved women's health trajectories.

LIST OF ABBREVIATIONS

AAPEC - Australian Action on Preeclampsia

CH - chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia

CVD - cardiovascular disease

GH - gestational hypertension

GP - general practitioner

HCP - healthcare provider

HDP - hypertensive disorder of pregnancy

ISSHP - International Society for the Study of Hypertension in Pregnancy

PE - preeclampsia

PVD - peripheral vascular disease

SOMANZ - Society of Obstetric Medicine Australia New Zealand

STATEMENTS

Ethical approval

Ethical approval has been provided by South-Eastern Sydney Local Health District Human Research Ethics Committee (Ref: 18/POWH/326). The ratification for the University of Technology Sydney has also been obtained under ETH18-3061.

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Access to data examined in this study

The authors have full access to all data reported in the study.

Transparency statement and competing interests

The article is the authors' original work, has not received prior publication and is not under consideration for publication elsewhere. All the authors have seen and approved the manuscript being submitted. The manuscript is an honest, accurate, and transparent account of the study being reported, no important aspects of the study have been omitted. We have read and understood BMJ policy on declaration of interests and declare that we have no competing interests. This manuscript presents partial results from Heike Roth's PhD research. The project is supervised by Caroline Homer and Amanda Henry.

Authors contributions

Heike Roth, Amanda Henry and Caroline Homer contributed to the conception and design of the study as well as the distribution of the survey and writing of the manuscript. Heike Roth led the analysis of the survey data, drafting and designed the Tables, Figures and Appendixes and wrote the first draft. Grace LeMarquand was a medical Honours student assisting with pre-survey interviews as well as initial data analysis. Lynne Roberts assisted in the survey development, supported the distribution, the interpretation of the findings and the discussion. Mark Brown contributed to the design of the survey and supported the interpretation of the findings and the discussion. As a maternity consumer, Lisa Hanley has assisted with the survey design and ensured appropriate use of language and content as well as supported the distribution. All authors contributed to drafts and revising of the paper and all approved the final version.

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Authors' information (optional)

This manuscript presents partial results from Heike Roth's PhD research. The project is supervised by Caroline Homer and Amanda Henry.

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TABLES, SUPPLEMENTARY TABLES, APPENDICES AND FIGURES

Table legend

Table 1: Respondent demographics

Table 2: Means of risk factor knowledge of women

Table 3: Means of risk factor knowledge of women with a history of preeclampsia listed by time elapsed since HDP

Table 4: Proportion of conditions discussed when addressing future risk (Multiple answers collected) within and over 3 years since last HDP

Table 5: HDP women's preferences for content and distribution of information/education on future risk after HDP (Multiple answers collected) in order of preference

Supplementary data

Supplementary Table 1: Current CVD risk factors of HDP and non-HDP women (Multiple answers collected) in order of frequency

Supplementary Table 2: Chronic Hypertension
a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")
b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

Supplementary Table 3: Diabetes
a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")
b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

Supplementary Table 4: Renal Disease
a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")
b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

Supplementary Table 5: Heart Attack
a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")
b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

Supplementary Table 6: HDP next pregnancy

a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")
b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

Supplementary Table 7: Stroke
a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")
b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

Supplementary Table 8: Heart Disease
a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")
b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

Supplementary Table 9: Peripheral Vascular Disease
a) - Women with HDP likelihood of risk compared to non-HDP ("Do you think you a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")
b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

Supplementary Table 10: Breast Cancer
a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")
b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

Supplementary Table 11: Seizures
a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")
b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

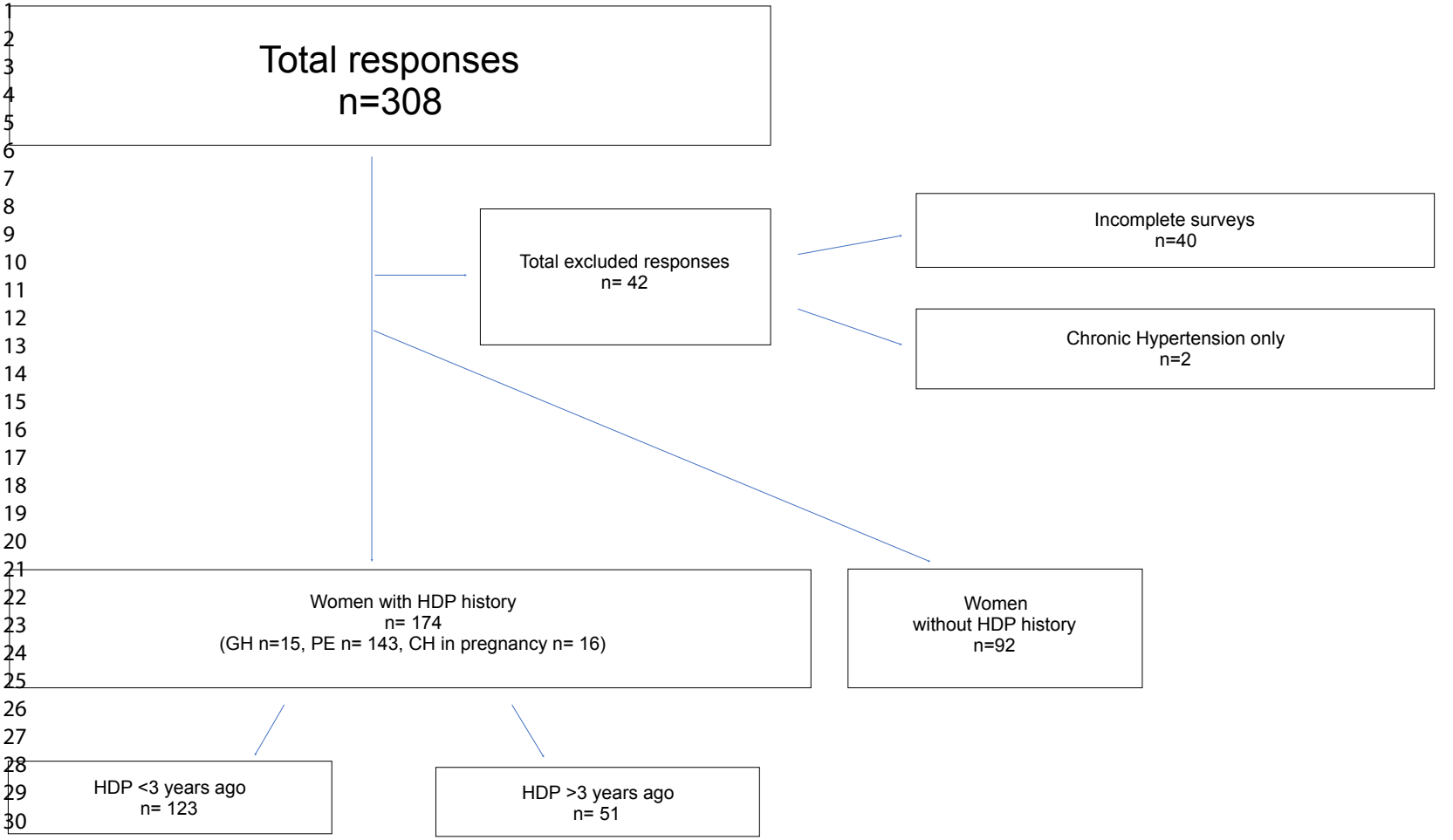
Supplementary Table 12: Proportion of participants scoring 'high', 'moderate' and 'low' by type of HDP and non-HDP

Supplementary Table 13: HDP and non-HDP women's answers to timing of rise of risk with signs and symptoms starting to show

Appendices
Appendix 1: Survey for women

Figure legend
Figure 1: Survey inclusion

Figure 1: Survey Inclusion



HDP- hypertensive disorder of pregnancy, GH - gestational hypertension, PE - preeclampsia, CH in pregnancy - chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia

Supplementary Table 1: Current CVD risk factors of HDP and non-HDP women (Multiple answers collected) in order of frequency

	GH	PE	CH	Total HDP	non-HDP	P HDP vs non HDP
	n=15	n=143	n=16	n=174	n=92	
	n (%)*	n (%)*	n (%)*	n (%)*	n (%)*	
None of the options	6 (40)	52 (36)	2 (13)	60 (34)	57 (62)	<0.001
Obesity	5 (33)	38 (27)	7 (44)	50 (29)	10 (11)	0.001
Family History Heart disease	3 (20)	37 (26)	6 (38)	46 (26)	14 (15)	0.037
Hypertension	3 (20)	30 (21)	12 (75)	35 (20)	0 (0)	<0.001
Renal problems	0 (0)	21 (15)	2 (13)	23 (13)	0 (0)	<0.001
Smoking	0 (0)	10 (7)	3 (19)	13 (7)	2 (2)	0.075
History of cardiovascular event**	0 (0)	1 (1)	0 (0)	1 (1)	0 (0)	0.356
Diabetes	0 (0)	5 (3)	2 (13)	7 (4)	0 (0)	0.014
Alcohol consumption	0 (0)	0 (0)	1 (6)	1 (1)	0 (0)	0.356
High Cholesterol	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	-

*Table represents frequency of each option; percentages add to over 100% as women were asked to select any/all that applied.
**angina, stroke or heart attack
PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

Supplementary Table 2: Chronic Hypertension

a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")

	GH pregnancy n=15	**PE pregnancy n=143**	**CH pregnancy n=16**	**Total n=174**
	n (%)	**n (%)**	**n (%)**	**n (%)**
Less likely	0 (0)	1 (1)	0 (0)	1 (1)
Same likelihood	2 (13)	14 (10)	1 (6)	17 (10)
More likely (correct)	8 (53)	111 (78)	13 (81)	132 (76)
I do not know	5 (33)	17 (12)	2 (13)	24 (14)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

	non-HDP n=92
	n (%)
Less likely (correct)	57 (62)
Same likelihood	22 (24)
More likely	1 (1)
I do not know	12 (13)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

Supplementary Table 3: Diabetes

a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")

	GH pregnancy n=15	PE pregnancy n=143	CH pregnancy n=16	Total n=174
	n (%)	n (%)	n (%)	n (%)
Less likely	0 (0)	1 (1)	0 (0)	1 (1)
Same likelihood	3 (20)	61 (43)	5 (31)	69 (40)
More likely (correct)	4 (27)	35 (25)	5 (31)	44 (25)
I do not know	8 (53)	44 (31)	6 (38)	58 (33)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

	non-HDP n= 92
	n (%)
Less likely (correct)	32 (35)
Same likelihood	39 (42)
More likely	4 (4)
I do not know	17 (19)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

Supplementary Table 4: Renal Disease

a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")

	GH pregnancy n=15	PE pregnancy n=143	CH pregnancy n=16	Total n=174
	n (%)	n (%)	n (%)	n (%)
Less likely	0 (0)	2 (1)	0 (0)	2 (1)
Same likelihood	2 (14)	30 (21)	1 (7)	33 (19)
More likely (correct)	4 (29)	77 (55)	11 (73)	92 (54)
I do not know	8 (57)	32 (23)	3 (20)	43 (25)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

	non-HDP n=92
	n (%)
Less likely (correct)	39 (42)
Same likelihood	31 (34)
More likely	0 (0)
I do not know	22 (24)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

Supplementary Table 5: Heart Attack

a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")

	GH pregnancy n=15	PE pregnancy n=143	CH pregnancy n=16	Total n=174
	n (%)	n (%)	n (%)	n (%)
Less likely	0 (0)	1 (1)	0 (0)	1 (1)
Same likelihood	1 (7)	20 (14)	1 (7)	22 (13)
More likely (correct)	8 (53)	98 (69)	12 (80)	118 (69)
I do not know	6 (40)	23 (16)	2 (13)	31 (18)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

	non-HDP n=92
	n (%)
Less likely (correct)	48 (53)
Same likelihood	23 (25)
More likely	0 (0)
I do not know	20 (22)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

Supplementary Table 6: HDP next pregnancy

a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")

	GH pregnancy n=15	PE pregnancy n=143	CH pregnancy n=16	Total n=174
	n (%)	n (%)	n (%)	n (%)
Less likely	0 (0)	2 (1)	0 (0)	2 (1)
Same likelihood	0 (0)	9 (6)	0 (0)	9 (5)
More likely (correct)	13 (87)	128 (89)	15 (100)	156 (90)
I do not know	2 (13)	4 (3)	0 (0)	6 (4)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

	non-HDP n=92
	n (%)
Less likely (correct)	65 (71)
Same likelihood	19 (21)
More likely	0 (0)
I do not know	8 (9)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

Supplementary Table 7: Stroke

a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")

	GH pregnancy n=15	PE pregnancy n=143	CH pregnancy n=16	Total n=174
	n (%)	n (%)	n (%)	n (%)
Less likely	0 (0)	1 (1)	0 (0)	1 (1)
Same likelihood	1 (7)	18 (13)	1 (7)	20 (12)
More likely (correct)	7 (47)	89 (63)	13 (87)	109 (64)
I do not know	7 (47)	33 (23)	1 (7)	41 (24)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

	non-HDP n=92
	n (%)
Less likely (correct)	49 (53)
Same likelihood	24 (26)
More likely	0 (0)
I do not know	19 (21)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

Supplementary Table 8: Heart Disease

a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")

	GH pregnancy n=15	PE pregnancy n=143	CH pregnancy n=16	Total n=174
	n (%)	n (%)	n (%)	n (%)
Less likely	0 (0)	1 (1)	0 (0)	1 (1)
Same likelihood	2 (13)	18 (13)	1 (7)	21 (12)
More likely (correct)	7 (47)	99 (70)	12 (80)	118 (67)
I do not know	6 (40)	24 (17)	2 (13)	32 (19)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

	non-HDP n=92
	n (%)
Less likely (correct)	46 (50)
Same likelihood	27 (29)
More likely	0 (0)
I do not know	19 (21)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

Supplementary Table 9: Peripheral Vascular Disease

a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")

	GH pregnancy n=15	PE pregnancy n=143	CH pregnancy n=16	Total n=174
	n (%)	n (%)	n (%)	n (%)
Less likely	0 (0)	0 (0)	0 (0)	0 (0)
Same likelihood	2 (13)	20 (14)	1 (7)	23 (13)
More likely (correct)	5 (33)	72 (51)	8 (53)	85 (50)
I do not know	8 (53)	50 (35)	6 (40)	64 (37)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

	non-HDP n=92
	n (%)
Less likely (correct)	41 (45)
Same likelihood	29 (32)
More likely	0 (0)
I do not know	22 (24)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

Supplementary Table 10: Breast Cancer

a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")

	GH pregnancy n=15	PE pregnancy n=143	CH pregnancy n=16	Total n=174
	n (%)	n (%)	n (%)	n (%)
Less likely	0 (0)	0 (0)	0 (0)	0 (0)
Same likelihood (correct)	3 (20)	74 (53)	5 (36)	82 (48)
More likely	1 (7)	1 (1)	1 (7)	3 (2)
I do not know	11 (73)	66 (47)	8 (57)	85 (50)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

	non-HDP n=92
	n (%)
Less likely	6 (7)
Same likelihood (correct)	60 (65)
More likely	1 (1)
I do not know	25 (27)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

Supplementary Table 11: Seizures

a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")

	GH pregnancy n=15	PE pregnancy n=143	CH pregnancy n=16	Total n=174
	n (%)	n (%)	n (%)	n (%)
Less likely	0 (0)	0 (0)	0 (0)	0 (0)
Same likelihood (correct)	4 (27)	41 (29)	2 (13)	47 (27)
More likely	1 (7)	41 (29)	4 (27)	46 (27)
I do not know	10 (67)	60 (42)	9 (60)	79 (46)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

	non-HDP n=92
	n (%)
Less likely	25 (27)
Same likelihood (correct)	40 (44)
More likely	0 (0)
I do not know	27 (29)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

Supplementary Table 12: Proportion of participants scoring ‘high’, ‘moderate’ and ‘low’ by type of HDP and non-HDP

	GH n=15 n(%)	PE n=143 n(%)	CH n=16 n(%)	P GH vs PE	P GH vs CH	P PE vs CH	HDP n=174 n(%)	non-HDP n=92 n(%)	P HDP vs non- HDP
High (score 8-10)	4 (27)	48 (34)	5 (31)	0.59	0.78	0.67	57 (33)	30 (33)	0.98
Moderate (score 5-7)	3 (20)	52 (36)	7 (44)	0.21	0.16	0.56	62 (36)	25 (27)	0.16
Low (score 0-4)	8 (53)	43 (30)	4 (25)	0.67	0.11	0.85	55 (32)	37 (40)	0.16
Total	15 (100)	143 (100)	16 (100)	-	-	-	174 (101)	92 (100)	-

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy.

The colour coding in addition to the mean scores aims to highlight the areas of ‘low’ (red), ‘moderate’ (orange) and ‘high’ (green) knowledge.

	LOW
	MODERATE
	HIGH

Supplementary Table 13: HDP and non-HDP women's answers to timing of rise of risk with signs and symptoms starting to show

	GH	PE	CH	HDP	Non HDP	P
	n=15	n=143	n=16	n=174	n=92	HDP vs non-HDP
	n (%)*	n (%)*	n (%)*	n (%)*	n (%)*	
<10 years	4 (27)	42 (29)	9 (56)	55 (32)	41 (45)	0.036
10-15 years	3 (20)	28 (20)	2 (13)	33 (19)	15 (16)	0.591
16-20 years	0 (0)	13 (9)	0 (0)	13 (8)	1 (1)	0.013
>20 years	3 (20)	5 (4)	0 (0)	8 (5)	2 (2)	0.302
Not sure/don't know	1 (7)	48 (34)	1 (6)	52 (30)	33 (36)	0.319
I don't think I will get any of these as I maintain a healthy lifestyle	4 (27)	7 (5)	2 (13)	13 (8)	N/A	-
TOTAL	15 (101)	143 (101)	16 (101)	174 (102)	92 (100)	

* Percentages may not add to 100% as figures are rounded to whole numbers only

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

LONG TERM HEALTH AFTER BLOOD PRESSURE PROBLEMS IN PREGNANCY

You are invited to take part in a survey to gain insight into what women like yourself who have been pregnant before know about women's heart health. We are interested in the views of all women especially women who had high blood pressure (hypertension) or preeclampsia in pregnancy.

You can complete the survey if you are currently pregnant (with no major issues so far this pregnancy) or have been pregnant in the last three (3) years. You may have experienced high blood pressure in pregnancy OR you may have experienced a pregnancy without any serious complications.

The study is being conducted by the University of NSW, University of Technology Sydney and the Sydney Partnership for Health, Education, Research and Enterprise (SPHERE). The study is being undertaken by:

- **Dr. Amanda Henry - Obstetrician at St George and Royal Hospital for Women, Randwick, Senior Lecturer UNSW and SPHERE member**
- **Distinguished Professor Caroline Homer - UTS, Midwifery Faculty of Health and SPHERE member**
- **Dr. Clare Arnott - Cardiologist, Royal Price Alfred Hospital**
- **Mrs. Heike Roth - PhD Candidate at University of Technology, Sydney**
- **Mrs. Lynne Roberts - Research Midwife at St George Hospital, SESLHD.**

This work is occurring as part of Mrs Heike Roth's PhD studies and the NHMRC Fellowship of Dr. Henry. Apart from salary support for Dr. Henry, the study is otherwise unfunded.

If you agree to take part in this survey, it should only take about 15 minutes to complete and will involve answering questions about you, your pregnancy and your understanding of long term health in women who have been diagnosed with blood pressure problems in pregnancy.

Participation in this study is entirely voluntary and if you do not wish to take part it will have no effect on the care you are currently receiving. If you decide to participate, and throughout the survey think you would like to withdraw/not complete the survey, you can simply stop and not submit your answers. If you have already submitted your survey, it will not be possible to withdraw the data you have provided as the surveys are anonymous.

The information you provide will not be identifiable and will be kept securely until destroyed as per the South East Sydney Local Health District's requirements.

The study results will be published in a research thesis, in peer reviewed journals and presented at conferences and other professional forums. No one will be able to identify you from this information.

If you would like to personally receive results, you will have the option to leave your email details. The results will be available one (1) year after conclusion of the survey and your email will not be used for any other purpose.

If you would like any further information about the study or you experience any distress or concern as a result of completing this survey, please contact the Principal Investigator, Dr Amanda Henry on 02 91132315 or via email Amanda.henry1@health.nsw.gov.au. For medical assistance you can consult your General Practitioner. If you would like further information about the topic addressed in this study, you can visit the Australian Heart Foundation on the following link: https://www.heartfoundation.org.au/your-heart/women-and-heart-disease/womens-stories.

If you have any concerns or complaints about the conduct of this study, you should contact the Research Support Office of the South Eastern Sydney Local Health District Human Research Ethics Committee which is nominated to receive complaints from research participants. You should contact them on 02 9382 3587, or email SESLHD-RSO@health.nsw.gov.au and quote HREC 18/156.

* 1. I acknowledge that participation in the survey is voluntary

☐ Yes

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

ABOUT YOU

These first few questions are to find out about you, your background, and occupation. Questions marked with a green asterisk (*) simply mean that they must be answered in order to continue.

* 2. What age group are you in?

- ◯ 18-25
- ◯ 26-35
- ◯ 36-45
- ◯ 46-55
- ◯ 56+
- ◯ Prefer not to answer

* 3. What ethnic group do you identify with? (Please select one answer)

- ◯ Caucasian
- ◯ Asian
- ◯ Polynesian or Maori
- ◯ Other (please specify)
- ◯ Aboriginal or Torres Strait Islander
- ◯ European
- ◯ Prefer not to answer

* 4. What is your highest level of formal education?

- ◯ Secondary school
- ◯ Trade Certificate/Diploma
- ◯ Other (please specify)
- ◯ University degree
- ◯ Prefer not to answer

5. What is your usual occupation/profession?

* 6. Are you currently in a relationship?

- ◯ Yes
- ◯ No
- ◯ Prefer not to answer

* 7. Where did you hear about this survey?

- P4 Newsletter
- Australian Action on Preeclampsia (AAPEC)
- Tresillian
- Maternity Choices Australia
- Other (please specify)
- Maternity Consumer Network
- Maternity Clinics
- Social media (Facebook, Twitter)
- Australian College of Midwives

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

ABOUT YOUR HEALTH

These next questions are about your general health.
Questions marked with a green asterisk (*) simply mean that they must be answered in order to continue.

* 8. Are you currently pregnant?

- ◯ Yes
- ◯ No
- ◯ Prefer not to answer

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

ABOUT YOUR HEALTH

Questions marked with a green asterisk (*) simply mean that they must be answered in order to continue.

9. How many weeks pregnant are you? (provide whole numbers only, for example: 24)

10. How many children have you given birth to (20 weeks gestation and over)?

* 11. Have you ever had any of the following, whilst pregnant or before or after pregnancy? (select all that apply)

- [ ] High blood pressure
- [ ] High BMI (overweight)
- [ ] Angina
- [ ] Diabetes
- [ ] Kidney problems
- [ ] Other (please specify)
- [ ] Stroke
- [ ] Significant illness
- [ ] Heart attack
- [ ] None of the above/ no significant other medical complication

* 12. From the list below, which currently apply to you? (select all that apply)

- [ ] Smoking
- [ ] Obesity
- [ ] Alcohol consumption
- [ ] Family history of heart disease
- [ ] High cholesterol
- [ ] High blood pressure
- [ ] Diabetes
- [ ] None of the above

Other (please specify)

13. Please provide the details of any prescribed medications you are taking

- ( ) I do not take any prescribed medication
- ( ) I take prescribed medication (please list the medications or leave blank if you prefer not to answer)

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

PREGNANCY

This section is about your pregnancy history.
Questions marked with a green asterisk (*) simply mean that they must be answered in order to continue.

DEFINITIONS OF BLOOD PRESSURE PROBLEMS

Here are some definitions of certain types of blood pressure problems in pregnancy. You may find these useful in order to more easily understand and answer the next questions.

Chronic hypertension: is if you had high blood pressure before falling pregnant, have high blood pressure outside of pregnancy, or were found to already have high blood pressure in the first half of your pregnancy. Chronic hypertension may have no known underlying cause (this is sometimes called "essential" hypertension), or it may be as a result of another underlying condition, such as kidney disease.

Gestational hypertension: is when you might have had high blood pressure for the first time in your pregnancy (after 20 weeks of pregnancy) but were otherwise well (that is, high blood pressure only but no effect on your baby's growth or on your health otherwise).

Preeclampsia: is when you have had high blood pressure in pregnancy (after 20 weeks of pregnancy) and some additional signs or issues in you and/or your baby. For example, you might have had protein in your urine, liver or kidney problems that showed up on blood tests, or there may have been concerns about the growth of your baby while you were pregnant.

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

PREGNANCY

Questions marked with a green asterisk (*) simply mean that they must be answered in order to continue.

We understand that you may find some of the questions difficult to answer as they might remind you of a challenging time in your life. We are grateful for your participation and contribution to improving knowledge on future health for women who had blood pressure problems in pregnancy. You will find some explanations at the end of the survey and a contact, in case you would like to seek further clarification and/or assistance.

* 14. Choose the situation which best describes your pregnancy history

- ◯ At least one pregnancy is/was affected by gestational hypertension
- ◯ At least one pregnancy is/was affected by preeclampsia
- ◯ I have only been diagnosed with chronic hypertension
- ◯ I had chronic hypertension before pregnancy and had/have pregnancies that were complicated further by higher than usual blood pressure
- ◯ I had chronic hypertension before pregnancy and had/have pregnancies that were complicated further by preeclampsia
- ◯ No pregnancy is/was affected

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

YOUR HEALTH DURING YOUR PREGNANCY

Questions marked with a green asterisk (*) simply mean that they must be answered in order to continue.

* 15. As someone who has chronic hypertension are you aware of any long term health issues that you are at risk of? (select all that apply)

- [ ] Diabetes
- [ ] Kidney disease
- [ ] Breast cancer
- [ ] Cardiac death
- [ ] High blood pressure complications in another pregnancy
- [ ] Stroke
- [ ] Peripheral vascular disease
- [ ] Other (please specify)
- [ ] Leukaemia
- [ ] Seizures
- [ ] Overall mortality risk is higher
- [ ] Ischaemic heart disease/heart attack
- [ ] I think there are health risks but unsure which conditions I may be at risk of
- [ ] I do not think that there are increased risks

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

* 16. How many years after blood pressure problems in pregnancy do you think the various signs and symptoms of the potential risks may start to appear?

- ◯ < 10 years after pregnancy
- ◯ 10-15 years after pregnancy
- ◯ 16-20 years after pregnancy
- ◯ > 20 years after pregnancy
- ◯ Not sure/do not know
- ◯ Other (please specify)

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

Chronic Hypertension only -TYPE OF CARE RECEIVED DURING PREGNANCY

Questions marked with a green asterisk (*) simply mean that they must be answered in order to continue.

17. If a healthcare provider did speak to you about your future health risks, when did this occur?

- [ ] Before birth
- [ ] Immediately after birth
- [ ] Within first 6 weeks
- [ ] 6 weeks to 6 months
- [ ] 6 months to 1 year
- [ ] 1 year and over
- [ ] I cannot remember

* 18. When would be a good time to receive information about long term health risks in your gestational hypertension or preeclampsia experience?

During pregnancy/at birth 12 months after birth 24 months after birth

* 19. As a result of your pregnancy affected by blood pressure problems, were you referred to any of the below after your baby was born? (tick all that apply)

- [ ] Cardiologist
- [ ] Renal (kidney) Physician
- [ ] General Practitioner
- [ ] Other (please specify)
- [ ] Fitness centre for exercise
- [ ] Nutritionist for dietary adjustment
- [ ] I cannot remember

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

20. During your pregnancies over the last 3 years (20 weeks pregnancy and over), which blood pressure problem were you diagnosed with?

	Gestational Hypertension	Preeclampsia	No blood pressure problem diagnosed this pregnancy	I cannot remember	Not applicable
First Pregnancy	○	○	○	○	○
Second Pregnancy	○	○	○	○	○
Third Pregnancy	○	○	○	○	○

Any comments?

* 21. How long ago was your most recent pregnancy that was affected by a blood pressure problem?

- ○ 0-6 months
- ○ 6-12 months
- ○ 1-2 years
- ○ 2-3 years
- ○ more than 3 years ago

* 22. At what point in time were you diagnosed? (Choose a most accurate time frame)

	20-28 weeks	28-34 weeks	34-37 weeks	37-40 weeks	40-42 weeks	During or after giving birth	No diagnosis of blood pressure problem this pregnancy	I cannot remember	Not applicable
First Pregnancy	○	○	○	○	○	○	○	○	○
Second Pregnancy	○	○	○	○	○	○	○	○	○
Third Pregnancy	○	○	○	○	○	○	○	○	○

Any comments?

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

PREGNANCY

Questions marked with a green asterisk (*) simply mean that they must be answered in order to continue.

* 23. Did you have a *planned* induction of labour or *planned* caesarean section due to your blood pressure problems?

	Yes, planned induction of labour because of blood pressure issues in pregnancy	Yes, planned caesarean section because of blood pressure issues	Yes, planned caesarean for other reasons than blood pressure	No planned induction and no planned caesarean section	I cannot remember	Not applicable
First Pregnancy	○	○	○	○	○	○
Second Pregnancy	○	○	○	○	○	○
Third Pregnancy	○	○	○	○	○	○

Any Comments?

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

LONG TERM HEALTH RISKS

This section is about some long term health risks that some women may experience after having had blood pressure problems in pregnancy.

For this section we would like you to think about the long-term health risks of a woman who has been diagnosed with high blood pressure in pregnancy.

Not everyone who experienced blood pressure problems in pregnancy will necessarily have health issues in the future. We would not want you to unnecessarily worry about any of these risks, therefore we will provide you with further information about long-term health after high blood pressure in pregnancy at the end of the survey.

* 24. FOR WOMEN **WITH** HISTORY OF BLOOD PRESSURE PROBLEMS IN PREGNANCY:

Compare yourself to a woman who has NOT had blood pressure problems in pregnancy.

Do you think you have a lower/same/higher chance of getting the following:

	Less chance than a woman without blood pressure in pregnancy	Same chance as a woman without blood pressure in pregnancy	Higher chance than a woman without blood pressure in pregnancy	Not sure/I do not know
High blood pressure later in life	○	○	○	○
Diabetes	○	○	○	○
Kidney disease	○	○	○	○
Breast cancer	○	○	○	○
Heart attack	○	○	○	○
High blood pressure in another pregnancy	○	○	○	○
Stroke	○	○	○	○
Heart disease	○	○	○	○
Seizures	○	○	○	○
Vascular Disease	○	○	○	○

If you are concerned by any of the above potentially affecting you, information is available at the end of the survey where risks are explained.

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

For this section we would like you to think about the long term health risks of a woman who has been diagnosed with high blood pressure in pregnancy.

* 25. FOR WOMEN WITHOUT HISTORY OF BLOOD PRESSURE PROBLEMS IN PREGNANCY:

Compare yourself to a woman who HAS had blood pressure problems in pregnancy.

Do you think you have a lower/same/higher chance of getting the following:

	Less chance than a woman with blood pressure in pregnancy	Same chance as a woman with blood pressure in pregnancy	Higher chance than a woman with blood pressure in pregnancy	Not sure/I do not know
High blood pressure later in life	○	○	○	○
Diabetes	○	○	○	○
Kidney disease	○	○	○	○
Breast cancer	○	○	○	○
Heart attack	○	○	○	○
High blood pressure in another pregnancy	○	○	○	○
Stroke	○	○	○	○
Heart disease	○	○	○	○
Seizures	○	○	○	○
Vascular Disease	○	○	○	○

* 26. How many years after blood pressure problems in pregnancy do you think the various signs and symptoms of the potential risks may start to appear?

- ○ < 10 years after pregnancy
- ○ 10-15 years after pregnancy
- ○ 16-20 years after pregnancy
- ○ Other (please specify)
- ○ > 20 years after pregnancy
- ○ Not sure/do not know

If you are concerned by any of the above potentially affecting you, information is available at the end of the survey where risks are explained.

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

* 27. How many years after blood pressure problems in pregnancy do you think the various signs and symptoms of the potential risks may start to appear?

- ◯ < 10 years after pregnancy
- ◯ 10-15 years after pregnancy
- ◯ 16-20 years after pregnancy
- ◯ > 20 years after pregnancy
- ◯ Not sure/do not know
- ◯ I don't think I will get any of these as I maintain a healthy lifestyle
- ◯ Other (please specify)

IN CASE OF DISTRESS

If you experience any distress caused due to the completion of this survey, please contact your GP or the Principal Investigator of this study, Dr Amanda Henry on 02 91132315 or Amanda.henry1@health.nsw.gov.au

For more information on this topic please visit The Australian Heart Foundation on the following link: https://www.heartfoundation.org.au/your-heart/women-and-heart-disease/womens-stories

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

TYPE OF CARE RECEIVED DURING PREGNANCY WHERE A BLOOD PRESSURE PROBLEM WAS DIAGNOSED

Questions marked with a green asterisk (*) simply mean that they must be answered in order to continue.

It is quite likely that some of the following questions may bring back some memories or bring rise to emotions that you find difficult to deal with. Please contact the Principal Investigator, Dr Amanda Henry on 02 91132315 or via email Amanda.henry1@health.nsw.gov.au if you would like to discuss these concerns. For medical assistance you can consult your General Practitioner.

* 28. Have you ever been admitted to a 'High Dependency Unit' or 'Intensive Care Unit' as a result of your blood pressure problem in pregnancy?

- ◯ Yes
- ◯ No
- ◯ I am not sure
- ◯ I cannot remember

* 29. Have any of your babies been admitted to 'Neonatal Intensive Care', 'High Dependancy Unit' or 'Special Care Nursery' as a result of your blood pressure problem in pregnancy?

- ◯ Yes
- ◯ No
- ◯ I am not sure

30. After your baby was born have you had any of the following? (select all that apply)

- ☐ Blood pressure measurement in hospital
- ☐ Blood pressure measurement with my GP
- ☐ Consultation with an obstetrician
- ☐ Consultation with a renal (kidney) specialist
- ☐ Consultation with an obstetric medicine specialist (doctor who specialises in complications of pregnancy like high blood pressure)
- ☐ I cannot remember
- ☐ Other (please specify)

* 31. After your baby was born, did someone speak to you about any of the below future health risks? (select all that apply)

- [ ] Increased risk of high blood pressure
- [ ] Increased risk of kidney problems
- [ ] Increased risk of stroke
- [ ] Increased risk of heart attack
- [ ] Increased risk of vascular disease
- [ ] Other (please specify)
- [ ] Risk of hypertensive disease in your next pregnancy
- [ ] I was told to eat a healthy diet, do some exercise and live normally
- [ ] No risks were discussed
- [ ] I cannot remember

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

TYPE OF CARE RECEIVED DURING PREGNANCY WHEN A BLOOD PRESSURE PROBLEM WAS DIAGNOSED

Questions marked with a green asterisk (*) simply mean that they must be answered in order to continue.

32. If a healthcare provider did speak to you about your future health risks, when did this occur?

- [ ] Before birth
- [ ] Immediately after birth
- [ ] Within first 6 weeks
- [ ] 6 weeks to 6 months
- [ ] 6 months to 1 year
- [ ] 1 year and over
- [ ] I cannot remember

* 33. When would be a good time to receive information about long term health risks in your gestational hypertension or preeclampsia experience?

During pregnancy/at birth 12 months after birth 24 months after birth

* 34. As a result of your pregnancy affected by blood pressure problems, were you referred to any of the below after your baby was born? (tick all that apply)

- [ ] Cardiologist
- [ ] Renal (kidney) Physician
- [ ] General Practitioner
- [ ] Other (please specify)
- [ ] Fitness centre for exercise
- [ ] Nutritionist for dietary adjustment
- [ ] I cannot remember

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

EDUCATION

In this section we would like to find out about your preferred ways of getting information about long term health after gestational hypertension and preeclampsia.

Questions marked with a green asterisk (*) simply mean that they must be answered in order to continue.

* 35. After experiencing gestational hypertension or preeclampsia what do you want to know about your long term health? (select all that apply)

- [ ] Risk reduction for subsequent pregnancies
- [ ] Reducing risk behaviours (eg. diet, exercise, smoking cessation)
- [ ] Statistics (eg. increased risk)
- [ ] At what point does the risk increase
- [ ] Signs and Symptoms
- [ ] Where to find information
- [ ] How to discuss the matter with my healthcare provider
- [ ] Impact on my children from the pregnancy affected by blood pressure problems
- [ ] Other (please specify)

* 36. How do you want to receive the information? (select all that apply).

- [ ] Key organisations addressing heart health (e.g. The Australian Heart Foundation or Her Heart)
- [ ] Social Media channels (e.g. Instagram, Facebook, Twitter)
- [ ] Brochures/Flyers
- [ ] Medical Professionals
- [ ] Podcasts/Media
- [ ] Online videos
- [ ] Other (please specify)

37. Is there anything else you would like to tell us?

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

POST-SURVEY OPTIONS AND SUMMARY OF RISK PROFILE

Some further things we would like you to consider:

38. We would like to have your opinion on what you think would be appropriate education material to improve women's knowledge. We would also like to know how the education could best be distributed to women. Would you like to participate in a **focus group** (one off - 2hrs max at St George Hospital, Sydney) or a **telephone interview** (one off 30 mins max)? By involving 'consumers', meaning women like you, the education package will have added value.

If you are interested in participate in either, you can leave your details here.

Name

Email Address

Phone Number

39. Please leave your email address to **receive results** from this study (in approx. 1 year). Your details will not be used for any other purpose.

Email Address

IN CASE OF DISTRESS

If you experience any distress caused due to the completion of this survey, please contact your GP or the Principal Investigator of this study, Dr Amanda Henry on 02 91132315 or Amanda.henry1@health.nsw.gov.au

For more information on this topic please visit The Australian Heart Foundation on the following link:
https://www.heartfoundation.org.au/your-heart/women-and-heart-disease/womens-stories

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

RISK PROFILE - LONG TERM RISKS AFTER BLOOD PRESSURE PROBLEMS IN PREGNANCY EXPLAINED

You may like to take a screenshot of the risk profile so you can refer back to it whenever you need to.

RISK PROFILE

Although most women will experience good long-term health after having high blood pressure in pregnancy, there are, unfortunately, some long term health risks associated with having had high blood pressure in pregnancy.

Women who have had high blood pressure during pregnancy are about 3 to 4 times more likely to develop chronic hypertension than women who did not have a blood pressure problems in pregnancy. They are also about twice as likely to get diabetes in later life, even if they did not have diabetes during pregnancy.

Blood pressure diseases are also more likely to happen in the next pregnancy to women who have already had a previous blood pressure problems in pregnancy compared to women who have not. Therefore, if they have had a pregnancy with blood pressure problems, it is important to be seen early in their next pregnancy. There are treatments that can decrease the chance of recurring problems.

Women are also more likely to get various forms of cardiovascular disease (heart disease, stroke, vascular disease) if they have had gestational hypertension, preeclampsia and/or chronic hypertension. All of these cardiovascular problems are about twice as likely to eventually happen to a woman who has had blood pressure problems in pregnancy compared to a woman who has not. This still means most women will not have heart disease or diabetes after having high blood pressure in pregnancy, especially if they can avoid risk factors like smoking or excessive weight gain, and maintain a healthy diet and exercise.

Kidney problems are about 5 to 10 times more common after preeclampsia in particular. Although the relative risk of developing kidney problems is substantially higher after preeclampsia, the absolute risk of long-term kidney disease is still low. Unless the woman already had a kidney problem, well over 90% of women after preeclampsia and gestational hypertension will not have a kidney problem.

Fortunately, although seizures may occur as a result of preeclampsia during pregnancy, women have no higher long term risk of seizures compared to women who did not have a complicated pregnancy. There is no increased risk of getting cancer (e.g. breast cancer, leukaemia) after having high blood pressure in pregnancy.

For all the long term health risks, these start to go up within 10 years after an affected pregnancy and are ongoing after that. Therefore, it is recommended that women attend regular blood pressure checks with their GP and discuss any changes they can make to improve their general health. For more general information about heart health and managing health risks, please visit the National Heart Foundation website: https://www.heartfoundation.org.au/your-heart/know-your-risks

THANK YOU FOR YOUR PARTICIPATION

STROBE Statement— **Assessing Australian women's knowledge about cardiovascular risk after hypertensive disorders of pregnancy and exploring information content and format preferences**

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-4
Objectives	3	State specific objectives, including any prespecified hypotheses	2
Methods			
Study design	4	Present key elements of study design early in the paper	2& 5-6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	2&6
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	5-6
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	-
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	-
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	-
Bias	9	Describe any efforts to address potential sources of bias	16
Study size	10	Explain how the study size was arrived at	5-6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	7
		(*b*) Describe any methods used to examine subgroups and interactions	
		(*c*) Explain how missing data were addressed	
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	

(*e*) Describe any sensitivity analyses

Continued on next page

Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	Fig 1
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8-9 Tab1
		(b) Indicate number of participants with missing data for each variable of interest	8
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	
		Cross-sectional study—Report numbers of outcome events or summary measures	
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	
		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	9-10 Table 3&4
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	15-16
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10-15
Generalisability	21	Discuss the generalisability (external validity) of the study results	17
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	19

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Assessing Australian women's knowledge and knowledge preferences about long-term health after hypertensive disorders of pregnancy: a survey study

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Assessing Australian women's knowledge and knowledge preferences about long-term health after hypertensive disorders of pregnancy: a survey study

Heike Roth[1], Caroline SE Homer[1,3], Grace LeMarquand[2], Lynne Roberts[2,7], Lisa Hanley[8], Mark Brown[5,6], Amanda Henry[1,2,4,7]

[1]Faculty of Health, University of Technology Sydney, Sydney, NSW, Australia [2]School of Women's and Children's Health, UNSW Medicine, University of NSW, Sydney, NSW, Australia [3]Burnet Institute, Maternal, Child and Adolescent Health, Melbourne, Victoria, Australia [4]The George Institute, Sydney, NSW, Australia [5]Dept. Renal Medicine, St George Hospital, Sydney, NSW, Australia, [6]St George & Sutherland Clinical School, UNSW, Sydney, NSW, Australia, [7]Dept. Women's and Children's Health, St George Hospital, Sydney, NSW, Australia, [8]Consumer, Sydney, Australia.

Corresponding author: Heike Roth

Email: heike.roth@student.uts.edu.au

Address: c/o Dr Amanda Henry, St George Hospital, Department of Women's and Children's Health, Kogarah NSW 2217, Australia.

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ABSTRACT

Objective(s): To (a) assess women's current knowledge regarding long-term cardiovascular health after hypertensive disorders of pregnancy (b) elicit women's preferred educational content and format regarding health after hypertensive disorders of pregnancy.

Design and setting: A custom-created online survey exploring Australian women's knowledge about long-term health after hypertensive disorders of pregnancy, distributed through consumer groups and social media.

Participants: 266 women with (n=174) or without (n=92) a history of hypertensive disorders of pregnancy.

Primary and secondary outcome measures: 1) Proportion of women identifying long-term health risks after hypertensive disorder of pregnancy using a 10-point risk knowledge score with 0-4 'low', 4.1-7.0 'moderate' and 7.1-10 'high'. 2) Exploration of preferred content, format and distribution of educational material post hypertensive disorder of pregnancy.

Results: Knowledge scores about health after hypertensive disorder of pregnancy were moderate in groups with and without a history of the disorder. Knowledge was highest regarding risk of recurrent hypertensive disorders in a subsequent pregnancy, 'moderate' for chronic hypertension and heart attack, 'moderate' and 'low' regarding risk of heart disease and 'low' for diabetes and renal disease. Only 36% of all participants were aware that risks start within 10 years after the affected pregnancy. The majority of respondents with a history of hypertensive disorder of pregnancy (76%) preferred receiving information about long-

term health 0-6 months postpartum from a healthcare provider (80%), key organisations (60%), social media (47%) and brochures/flyers (43%).

Conclusion(s): Women's knowledge regarding health risks after hypertensive disorder of pregnancy was 'moderate', although with important disease-specific gaps such as increased risk of diabetes. Most women wanted to be informed about their long-term health from a healthcare provider.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- Consumer co-created survey exploring health knowledge after hypertensive pregnancy.
- For the first time survey results include findings from women with a history of gestational hypertension as well as from women without a history of hypertensive disorder of pregnancy.
- Recruitment from groups with potentially greater baseline knowledge may bias results, although substantive knowledge gaps still found.
- Although surveys were available in English, Arabic and Mandarin, there remains potential sub-optimal coverage of culturally and linguistically diverse groups.

INTRODUCTION

Hypertensive disorders of pregnancy (HDP) include chronic hypertension (CH), preeclampsia (PE) and gestational hypertension (GH) and complicate 5-10% of pregnancies[1]. PE is a multi-system disorder characterised by new-onset hypertension after 20 weeks' gestation and involvement of one or more other organ systems and/or the fetus[2 3]. GH is new-onset hypertension after 20 weeks' gestation without any other complications. Apart from GH itself being considered an adverse pregnancy outcome

and it carrying an increased risk of progression to PE[2 3], is not associated with adverse pregnancy outcomes. However, both conditions are associated with long-term cardiovascular and other chronic disease sequelae[4 5]. CH is defined as hypertension that is confirmed before pregnancy or before 20 completed weeks gestation, which may worsen during pregnancy and/or on which preeclampsia may be superimposed[2] . Globally, cardiovascular disease (CVD) is one of the leading causes of death in women,[6] and for women who have experienced an HDP, it is 2-3 times higher compared with those who did not[4 7 8]. This risk of premature death is present within 10 years after the affected pregnancy[7 9 10] and remains after adjusting for the presence of other cardiovascular risk factors. There is also an increasing body of recent research linking PE and GH with other major chronic diseases including chronic kidney disease, end-stage kidney disease, and Type 2 diabetes mellitus[11-14].

Both Australian and international societies, including the Society of Obstetric Medicine of Australia and New Zealand (SOMANZ) and the International Society for the Study of Hypertension in Pregnancy (ISSHP), recommend that women and healthcare providers (HCP) are provided with information about HDP and later CVD[2 3]. This includes recommending that women have a clinical review several months postpartum, and regular general practitioner (GP) follow-up to monitor blood pressure, fasting lipids and blood sugar[2]. Adopting a healthy lifestyle with maintenance of an ideal weight and regular aerobic exercise is emphasised[2 3]. The aims of this study were to (a) explore Australian women's current knowledge on the topic of long-term CVD health after any HDP, not just PE and (b) elicit women's preferred educational content and format regarding health after HDP, as a basis for creating tailored information and health advice for women after HDP.

METHOD

A national survey of women with and without a history of HDP was conducted, using a custom-created, face-validated online survey. Ethical approval was provided by the relevant Human Research Ethics Committee (HREC 18/POWH/326, REGIS 2019/PID05668).

Patient and Public involvement

As a validated instrument to assess women's knowledge was unavailable, a survey was custom designed. Initially, women with a history of HDP, comprising nine volunteers from the *Postpartum physiology, psychology and paediatric follow up study (P4 Study)*[15] and Australian Action on Preeclampsia (AAPEC), were invited to take part in group interviews which addressed the possible content and design of the survey, tested the survey for face validity and provided feedback for improvement. The topics discussed during the interviews were sourced from findings from a scoping literature review[16] and further complemented by questions specifically exploring the Australian context for women experiencing HDP. Nine women participated in the face-validation process and commented on content, language, flow, survey structure including length, whether the introduction and the risk profile proposed for the end of the survey were informative as well as using appropriate language. Following feedback and integration of suggestions from the women, the survey was modified until consensus over a final version was achieved among study investigators, including the consumer representative (LH). The survey was made available in English, Arabic and Mandarin.

Data collection

The final survey was targeted at women in Australia, 18 years and older with a history of pregnancy in the last 3 years. Women who were currently pregnant were requested to only complete the survey if they had no major issues in their current pregnancy. Women not currently pregnant with pregnancy in the preceding three years were eligible either if they had experienced HDP (CH, GH or PE) or a pregnancy without any serious complications. The online survey, using SurveyMonkey™, was open from July to August 2019. Survey distribution occurred through the P4 study participants, organisations such as AAPEC, maternity consumer groups as well as via the project's consumer representative and social media (Facebook and Twitter) including multicultural networks in order to reach Arabic and Mandarin speaking communities. A targeted convenience sample was selected. Prior to acknowledging their voluntary participation at the commencement of the survey, women were presented with an introductory letter outlining the details of the study (Appendix 1). Commencement of the survey was then taken as consent to participate.

The data collection instrument

The survey for women (Appendix 1) explored demographic details, assessed obstetric history, history of HDP and other medical history including family history. The survey was tailored to women's self-reported HDP history (GH, PE, CH with or without worsening in pregnancy or superimposed PE, no hypertension history), with women given definitions of HDP conditions early in the survey to aid their self-report. Questions focused on knowledge of risk after pregnancy, provision of care and education following birth and what information and education women would like to receive. Women with a history of GH, PE or CH were asked to classify their perceived

risk (based on their own lived HDP sub-type) of experiencing various long-term health outcomes as greater, less than or equal to that of a woman with a normotensive pregnancy. Women who experienced a normotensive pregnancy were also asked to classify whether they believed women who had had HDP were at greater, lesser, or equal risk. The survey included two 'distractor' conditions not known to have an increased risk after HDP (breast cancer and seizures) to elicit negative answers and ascertain whether women could identify what they were not at increased risk of after HDP as well as what they were at risk of. At survey completion, women were provided with a correct risk profile summary and a link to further information.

Data Analysis

Quantitative survey analysis was undertaken using SPSS Version 25 (SPSS Statistics for Windows, Armonk, NY). Demographic data and responses to individual questions were analysed descriptively. To examine difference in knowledge levels amongst the targeted subgroups, (GH, PE, CH in pregnancy, no hypertension history) responses regarding HDP and future health risks were compared using Chi-squared testing or likelihood ratio for categorical data (as appropriate to subgroup sample size) and one-way ANOVA testing for continuous data. A p value of <0.05 was considered statistically significant.

A knowledge score was created for the risk matrix whereby 1 point was allocated to the correct answer, 0 for the incorrect answer, 0 for 'I do not know' and 0 for no answer/left blank. A mean knowledge score for each condition/health outcome was calculated and a scale of 'low', 'moderate' and 'high' knowledge was established. The ranking classifications were chosen based on the data distribution and were divided

into three score categories. For each individual condition/health outcome's mean score, 'low knowledge' equated to a mean of 0.00-0.40, 'moderate knowledge' was 0.41-0.70 and 'high knowledge' a mean of 0.71-1.00. An overall mean score out of 10 (as there were 10 conditions) was calculated for the HDP and non-HDP groups (i.e. the HDP group's knowledge regarding their long-term health risks and the non-HDP group's knowledge regarding the long-term health risks of HDP women). This overall score was classified as 'low' 'moderate' or 'high' using the same mean ranges as were used for the individual conditions. Categorical analysis for proportions of each knowledge group ('high', 'moderate' and 'low') was also conducted to provide a further perspective.

RESULTS

In total, 308 survey responses were received (Figure 1). Forty-two were excluded: 40 for discontinuing the survey and not answering the question asking about their perception of lower/same/higher risk with regards to 10 health conditions, and two with 'CH only' (no worsening hypertension or superimposed PE in pregnancy) who were excluded due to small numbers. Of 266 included responses, 174 (65%) women had a lived experience of any HDP (will be known as HDP for reporting purposes) and 92 (35%) did not (will be known as non-HDP for reporting purposes). The HDP group consisted of 15 women with GH only (9%), 143 women with PE only (82%) and 16 women with CH plus superimposed pregnancy hypertension or PE (9%; will be known as CH). Of the HDP group, 123 (71%) had their most recent experience with HDP less than three years prior (32% <1 year prior and 39% 1-3 years prior).

Most respondents were in the 26-35 or 36-45 year age groups (91%), 89% were of Caucasian ethnicity, 90% pursued education beyond secondary school and 96% were in a relationship (Table 1). HDP women were more likely to be Caucasian, to have a history of diabetes, renal problems, be overweight and to have at least one additional cardiovascular risk factor than non-HDP women (Supplementary Table 1), and less likely to be university-educated. Half of all participants were sourced through social media (50%), with most of the remainder (45%) recruited via the P4 study (8% of HDP women, 46% of non-HDP women) and AAPEC (35% of HDP women).

Table 1: Respondent demographics

	Total	**GH**	**PE**	**CH**	**Total HDP**	**Total Non HDP**	**P value HDP vs non HDP**
	N(%)	**%**	**%**	**%**	**N (%)**	**N(%)**	
Total N	**266**	**15**	**143**	**16**	**174**	**92**	
AGE							
18-25	12 (5)	13	6	-	10 (6)	2 (2)	0.16
26-35	117 (44)	33	48	50	81 (47)	36 (39)	0.25
36-45	126 (47)	53	42	50	76 (44)	50 (54)	0.10
45+	10 (3)	-	5	-	7 (4)	3 (3)	0.75
Prefer not to answer	1 (0)	-	-	-	-	1 (1)	-
ETHNICITY							
Caucasian	236 (89)	93	97	81	165 (95)	71 (77)	<0.001
Asian	23 (9)	7	2	6	5 (3)	18 (20)	<0.001
Other[1]	7 (3)	-	1	13	4 (2)	3 (8)	0.65
HIGHEST EDUCATIONAL ATTAINMENT							
Secondary School	25 (9)	7	14	13	23 (13)	2 (2)	0.003
*Diploma/Trade**	69 (26)	33	33	50	60 (35)	9 (10)	<0.001
University Degree	171 (64)	60	52	38	90 (52)	81 (88)	<0.001
Prefer not to answer	1 (0)	-	1	-	1 (1)	-	-
RELATIONSHIP STATUS							
In a relationship	254 (96)	100	93	88	162 (93)	92 (100)	0.001
Not in a relationship	11 (4)	-	6	13	11 (6)	0 (1)	
Prefer not to answer	1 (0)	-	1	-	1 (1)	-	-
RECRUITED TO SURVEY VIA							
P4 Newsletter	56 (21)	13	8	6	14 (8)	42 (46)	<0.001
AAPEC	62 (23)	7	40	19	61 (35)	1 (1)	<0.001
Social Media	134 (50)	80	52	69	97 (56)	37 (40)	0.02
Other [2]	14 (5)	-	1	6	2 (1)	12 (13)	<0.001

* Diploma or Trade certificate

[1] Other: Indigenous Australian (n=1), Polynesian or Maori (n=2), mixed ethnicity (n=4).

[2] Other: Friend (n=11), ACM (n=1), Clinic (n=1), Maternity Consumer group other than AAPEC (n=1).

PE = preeclampsia GH = gestational hypertension CH = chronic hypertension, worsening in pregnancy and/or superimposed preeclampsia P4= Postpartum Physiology, Psychology, and Paediatric Study AAPEC= Australian Action on Preeclampsia ACM= Australian College of Midwives.

Table 2: Means of risk factor knowledge of women listed by type of HDP

	GH n=15	PE n=143	CH n=16	HDP n=174	Non HDP n=92	P Value HDP vs non HDP
Chronic Hypertension	0.53	0.78	0.81	0.76	0.62	0.02
Diabetes	0.27	0.24	0.31	0.25	0.35	0.12
Renal Disease	0.27	0.54	0.69	0.53	0.21	<0.001
Heart Attack	0.53	0.69	0.75	0.68	0.52	0.01
Repeat HDP	0.87	0.90	0.94	0.90	0.71	<0.001
Stroke	0.47	0.62	0.81	0.63	0.53	0.14
Heart Disease	0.47	0.69	0.75	0.68	0.50	0.005
PVD	0.33	0.50	0.50	0.32	0.45	<0.001
*Breast Cancer**	0.20	0.52	0.31	0.47	0.65	0.004
*Seizures**	0.27	0.29	0.13	0.27	0.44	0.01
OVERALL MEAN KNOWLEDGE SCORE (OUT OF 10)	**4.2**	**5.8**	**6.0**	**5.6**	**5.2**	0.21

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy, PVD= Peripheral Vascular Disease
* Breast cancer and seizures are distractors within the survey. These were included despite being conditions that women after HDP are not at greater risk of.

MEAN SCORE		
	LOW	0-0.40
	MODERATE	0.41-0.70
	HIGH	0.71-1

Average knowledge scores are shown in Table 2 and detailed results on which these scores are based are shown in Supplementary Tables 2-11. Overall knowledge of the 10 conditions in the survey was 'moderate' for both groups (5.6/10 amongst HDP and 5.2/10 amongst non-HDP, p=0.21), with 33% in both groups having "high" overall knowledge and 32% and 40% respectively having "low" overall knowledge (Supplementary Table 12). Women with a history of HDP had 'high' knowledge with regards to recurrence of HDP in a subsequent pregnancy (0.90) and risk of future CH

(0.76). The same group had 'moderate' knowledge regarding increased chance of conditions such as heart attack (0.68), heart disease (0.68) and stroke (0.63). Women without HDP history had 'high' knowledge (0.71) for HDP recurrence in a subsequent pregnancy. The same group of women had moderate knowledge of chronic hypertension (0.62) and stroke (0.53). Lowest knowledge across both groups was around the risk of future diabetes (0.25 HDP group and 0.35 for non-HDP group). Further 'low' scoring conditions were peripheral vascular disease (PVD) and renal disease. For most conditions HDP women had significantly higher knowledge than the non-HDP group. However, the non-HDP group were more likely to correctly identify that the risk of the two 'distractor' conditions, seizures or breast cancer, were equal for both groups.

Supplementary Table 13 shows knowledge score breakdown by time since pregnancy. In the subgroup of HDP women who experienced PE (n=143), average knowledge was similar amongst women who experienced HDP within the last three years (5.8/10), compared to those who experienced HDP more than three years ago (5.7/10). Of the HDP women, only 32% were aware that the cardiovascular conditions may start manifesting within 10 years after an affected pregnancy, compared with 45% of women in the non-HDP group (p=0.036). About a third in each group (30% HDP, 36% non-HDP) were unsure about timing of risk rise/when health conditions manifest (Supplementary Table 14).

Women with HDP history were asked about their personal experience of risk discussion with healthcare providers (Table 3 represents summary of collective HDP data, Supplementary Table 15 provides all findings by HDP sub-group). The most

frequent discussions about future health were regarding HDP in subsequent pregnancies (45%), risk of chronic hypertension (43%), and 'No discussion' (37%). Risk discussions were no more likely to have occurred in women with HDP less than 3 years ago or over 3 years ago. There were also no statistically significant differences found between HDP subgroups about whether future risks were discussed, or what types of risk were discussed.

Table 3: Proportion of conditions discussed when addressing future risk (multiple answers collected) within and over 3 years since last HDP (summary of collective HDP data)*

	Total n = 174 N (%)		Overall Total n = 174 N (%)	P value < 3 yrs vs >3 yrs
	<3yrs	>3yrs		
HDP next pregnancy	55 (45)	24 (47)	79 (45)	0.78
Chronic Hypertension	55 (45)	19 (37)	74 (43)	0.37
No discussion	**45 (37)**	**19 (37)**	**64 (37)**	**0.93**
Lifestyle changes	32 (26)	8 (16)	40 (23)	0.14
Heart Attack	22 (18)	7 (14)	29 (17)	0.50
Renal Disease	23 (19)	4 (8)	27 (16)	0.07
Stroke	20 (16)	6 (12)	26 (15)	0.45
Peripheral vascular disease	16 (13)	5 (10)	21 (12)	0.56
Cannot remember	6 (5)	2 (4)	8 (5)	0.78

*Table represents frequency of each option; percentages add to over 100% as women were asked to select any/all that applied. PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

When asked about preferences of the timing of a future risk discussion, the majority (76%) of women wanted a discussion 0-6 months postpartum. The topics most women with HDP wished to discuss (Table 4) are 'impact on my children from the pregnancy affected by HDP' (73%), 'signs and symptoms of the conditions' (67%), 'when does risk rise' (54%) and 'risk reduction for subsequent pregnancy' (54%). HDP women's preference for receiving information on long-term health after HDP is via a medical professional (80%), through key organisations such as The Australian Heart Foundation (60%) and social media (47%).

Table 4: HDP women's preferences for content and distribution of information/education on future risk after HDP (multiple answers collected) in order of preference

	GH %	PE %	CH %	Total HDP N (%)
Total N	**15**	**143**	**16**	**174**
Preference of Discussion Topics*				
Impact on my children from the pregnancy affected by HDP	73	80	63	136 (73)
Signs and Symptoms of the conditions	80	71	69	124 (67)
Risk reduction for subsequent pregnancy	40	62	44	101 (54)
When does the risk rise	40	61	50	101 (54)
Statistics	40	60	38	98 (53)
Reducing risk behaviours (diet, exercise, smoking cessation)	40	56	31	91 (49)
Where to find information	40	51	13	81 (44)
How to discuss the matter with my healthcare provider	27	40	25	65 (35)
Preference of Distribution*				
Medical professionals	73	82	75	140 (80)
Key organisations	53	61	63	105 (60)
Social Media	40	51	19	82 (47)
Brochures/Flyers	40	45	31	75 (43)
Online Videos	20	24	25	42 (24)
Podcast/Media	13	23	25	39 (22)

*Table represents frequency of each option; percentages add to over 100% as women were asked to select any/all that applied. PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

DISCUSSION

This study found overall, 'moderate' knowledge of health conditions after HDP amongst both HDP and non-HDP women. Amongst women with a history of HDP, highest knowledge was identified with regards to future risk of hypertension and repeat HDP in subsequent pregnancies. Conversely, knowledge of future risk of diabetes was low, as was knowledge of the "distractor" conditions among HDP women particularly. Diabetes as a future risk factor post HDP has previously not been reported on in

studies of women's knowledge, and our findings suggest this is an important knowledge gap to address.

Other novel aspects of our study are inclusion of women who had a history of GH as well as those with a history of PE, and assessing knowledge of non-HDP women's knowledge. Women after HDP had somewhat higher knowledge of most health risks than the non-HDP group, however non-HDP group also had better knowledge of some aspects such as timing of risk increase. However, both groups' knowledge of the early increase in risk was low, adding further concern and reason to address the knowledge gap. When looking at the proportion of participants scoring "high", these were equal between the HDP (33%) and non-HDP groups (33%), whilst proportions scoring "low" were similar enough (32% HDP versus 40% non-HDP) to not to show statistical significance. Our scoping review in 2019[16] identified that post HDP, women have insufficient knowledge of their long-term risks. By including non-HDP women we wanted to explore whether knowledge was similar between the groups, which if so would suggest HDP women are not receiving tailored, targeted information and/or any information received is not translated into knowledge of personal risk after HDP. Given women after HDP were not markedly more knowledgeable about their health risks than unaffected women, the research-to-practice translational gap is further highlighted and suggests women with a lived experience of HDP remain underinformed about their increased CVD risk.

A further important finding was that many HDP women were not made aware of future health risks, with 37% of HDP women reporting to have had 'no discussion' about their increased long-term risk. Women with more recent HDP were no more likely than

women with HDP>3 years ago to report having risks discussed, which is concerning. This finding suggests risk discussions may not have improved in recent years despite updated guidelines emphasising long-term health[2 3], and that the extensive evidence regarding long-term implications for women after HDP continues to be lost in the translation of research to practice. We are exploring reasons for this (e.g. lack of evidence base in guidelines, lack of provider knowledge of guidelines, siloed healthcare with insufficient handover from maternity care team to primary care) in our broader work.

Women's knowledge after GH has not been previously reported as far as we are aware even though GH has similar frequency and similar future CVD risk as PE[4 17]. Although only 9% of our sample were GH, this group had somewhat lower knowledge than the PE and CH groups regarding conditions after HDP (although mostly not reaching statistical significance). Over half reported receiving no discussion of health risks after GH. Despite the small number of women with a history of GH (n=15) contributing to the study, this suggests potential substantive knowledge gaps after GH to address in both women and healthcare providers.

International studies exploring women's knowledge have predominantly reported limited or no knowledge about the link between HDP and CVD[16], though our study found overall, 'moderate' knowledge of health conditions after HDP. The two conditions associated with highest knowledge were repeat HDP and risk of future hypertension. Findings were similar in Traylor et al.'s[18] survey conducted in the United States of America (USA), where 146 women post HDP were included (PE n=76, PE with severe features n=41, CH=29). Future hypertension and repeat HDP were

correctly identified by women as risk factors, however this knowledge was mainly reflected in the group of women who had experienced PE with severe features. In the United Kingdom (UK), Brown et al.[19] (n=12 women attending postnatal follow-up clinic) also found that women are aware of repeat HDP risks, however despite postnatal risk counseling, perception of hypertension and CVD risk was mainly associated with participants who had a family history of CVD. More recently in Australia, Hutchesson et al.[20] surveyed 127 women with PE in the two years prior, finding very high knowledge about future hypertension risk (96%, higher than our post-PE findings) and most were aware of stroke (67%) and CVD (66%) risks (similar to our findings). Over a third of women after PE had 'no discussion' about future risk in our study. Hutchesson et. al[20] reported over one third of their participants remained unaware of increased CVD risks, which is similar to our findings. Similarities may be explained by the fact that major source of PE participants for both, the Hutchesson et. al[20] survey and ours was the patient support/advocacy group AAPEC. Recruitment from this advocacy group may also explain a higher post-PE knowledge than other studies have reported.

Our study findings resonate with those from similarly targeted women in Canada, Portugal, UK, the USA and a previous Australian study, all conducted between 2013 and 2017[16]. Therefore, from a global perspective, these findings reinforce a persistent and concerning, research to consumer gap. With international guidelines, including ISSHP[2], specifically targeted to assist HCPs providing care to women on an international scale to better manage and address health after HDP, this practice gap of knowledge transmission to women would be expected to narrow.

Education preferences

Content

Women mostly wanted educational materials to address HDP impact on their children, signs and symptoms of conditions they are at higher risk of, the timing of when their risks rise, and how to best reduce risk of recurrent HDP. Similar preferences were expressed by the women included in Seely et al.'s[21] focus group of 20 women after PE, with the key concern being the impact the PE pregnancy may have had on the health of their children. More recently, a UK-based study[22], involving women with a history of HDP and healthcare providers (HCP), identified research priorities regarding HDP. The top-ranking priority identified was the long-term physical and mental health consequences of HDP for the woman, baby and family. Other 'uncertainties' expressed by participants regarding their lived experience of HDP included topics such as diagnosis and management in pregnancy, prevention of future complications, short and long-term consequences of HDP for the woman and the baby, prevention of recurrent HDP as well as educational needs of HCPs and support for women and their families. Our study, with focus on women in Australia, suggests that similar uncertainties may benefit from being addressed, hence validating the importance of our findings.

Format of education and access

Our study identified that women mostly wanted to receive information about long-term health after HDP from medical professionals. Key organisations who are experts on the topic, via social media and through information brochures were other acceptable avenues of access to information. This is in contrast to Skurnik et al's[23] focus group of 14 women after PE, whose preferences for educational materials about the link between CVD and PE were via pamphlets available in doctor's offices as well as via

online communities and topical blogs. However, Hird et al's[24] participants also expressed preference for healthcare providers as their information source, including wanting healthcare providers to guide them towards reliable online/external information sources rather than encounter irrelevant or potentially inaccurate information due to their self-initiated search. Hutchesson et al.[20] report that high knowledge amongst participants was mainly due to the women's own research rather than receiving all possible, relevant information from their healthcare provider. Overall, existing studies including ours would suggest that although women are very open to the use of online sources or information packs, their healthcare providers are seen as central to closing their knowledge gaps.

Time of risk discussion

An important element to consider when communicating about risk with women who have experienced GH or PE is the timing of these discussions, as situational factors of being a new mother may alter when women are most receptive to follow-up. In our study, three-quarters of the women preferred this to occur in the first six months after birth. As well as being their preference, this also aligns with the potential benefits of early intervention and would allow for addressing knowledge gaps found in this study around how soon the risk rises after HDP. Addressing future risk early but not immediately is also supported by Brown et al.'s study of women after PE, where participants suggested that six months postpartum was the timeframe where they felt they had transitioned into a more comfortable stage of parenting and were able to focus more on themselves again[19].

Strengths and limitations

The survey was co-created via a formalised process of seeking input and feedback on the usability, language and content from women who have previously experienced HDP. Although face-validation is a subjective process, involving consumers with a history of HDP gives added value to the survey.

Our knowledge score is both a strength, as it allows for a summary of findings across all the conditions and risks, and a limitation, as assigning cut-points for knowledge ranking is an arbitrary designation. Having included the distractor conditions (breast cancer and seizures) may also have altered the overall score. Whilst women are more likely to experience seizures during a pregnancy complicated by HDP compared to non-HDP women, the long-term risk of seizures is similar for both groups. Similarly, the association of HDP and future increased risk of cancer (including breast cancer) has been examined in a systematic review and meta-analysis, however proven not to be associated with increased future risks after HDP[25]. Distractor inclusion may well have lowered overall knowledge score, for example women believing that after HDP they are at more risk of ongoing seizures since this is a risk during PE-affected pregnancy. However, we believe inclusion of distractors and assessment of women's response to them is valid, as it is important for women to not incorrectly believe they are at increased risk of more conditions than they are, as well as having knowledge of their increased cardiovascular risk. The addition of women with a history of GH as well as women without any history of HDP, is also a strength to add broader perspective on this topic.

Limitations include demographic make-up of respondents, with HDP participants predominantly English speaking and Caucasian (95%) despite the survey being

available in Arabic and Mandarin as well as English. The non-HDP group (20% Asian background) had similar background demographics of Australian reproductive-aged women[26], and as HDP is more prevalent amongst the Caucasian population[27], the sample in the context of ethnic background actually is proportionally likely close to representative of Australian HDP and non-HDP women. However, it would have been preferable to also gain insight from more culturally and linguistically diverse groups in order to understand their knowledge base and address their needs within this context.

In the survey, women were asked to select their HDP history which was then used to group them for analysis. Women's diagnosis of HDP is by self-report is a limitation, as some bias may be introduced through inaccurate self-report of diagnosis. The broad geographical range and anonymous nature of the survey precluded any verification of diagnosis. However, women were provided with definitions of the various HDP conditions at the start of the survey to aid them in their self-report. Another limitation is where participants were recruited from, with close to half either drawn from the P4 study (an Australian post-HDP research study) or consumer group AAPEC. Therefore, there may be knowledge bias in the sample (i.e. a more knowledgeable group of participants than the overall HDP or non-HDP population). The women's level of active engagement in pursuing further information on their long-term risks as well as their level of motivation to participate in this study, further contributes to knowledge bias. The number of respondents in all included HDP subgroups are a small proportion of the total number of women experiencing HDP, which suggests volunteer bias and this affects generalisability. However, non-representative, specialised samples of women can be noted within most research addressing women's knowledge on long-term health after HDP[16]. As even this group with potentially greater baseline knowledge had

substantive knowledge gaps, our study highlights the need for interventions to improve knowledge of health after HDP.

Implications

Close to two decades worth of data have been collected[8] since research on the link between HDP and increased CVD risk emerged in the early 2000s, with the first systematic review published in 2007[25]. It could be expected that this knowledge, by now, would have been translated into practice and shared with HDP women, however our findings suggest that this is still not the case. This study is valuable from the public health perspective, given the wider context of prevalence and importance of cardiovascular disease in women. Findings from this study and the broader study it is embedded in, will contribute towards the development, application and evaluation of educational materials for women and healthcare providers. These future projects will address persistent knowledge-to-practice-gaps regarding improving women's cardiovascular health after HDP. Given the prevalence and impact of both HDP and CVD, this is valuable for women's health, and public health more broadly.

Guidelines such as ISSHP[2] and SOMANZ[3] suggest regular follow-up after HDP as well as counselling women with regards to their individual long-term CVD risk. Although available to the public, these are not designed for women. Compiling suitable information for women would be an important step towards closing the knowledge gap. It is important to establish preferred content, presentation and timing of education for post-HDP health for women as we have in this study, to maximise the chance that women will engage with and benefit from education.

CONCLUSION

This Australian survey of women's knowledge of risks after HDP, found varying knowledge from the targeted groups. Despite 'high' knowledge being demonstrated regarding some risks, overall significant knowledge gaps were identified for certain conditions, particularly diabetes, and for knowledge about the relatively early timing of when health risks increase after HDP. Identifying these gaps are important in planning tailored education for women, and to improve early intervention for modifiable CVD risks in women after HDP. Addressing these women's preferences for content and to have this delivered by their healthcare provider may further lead to enhanced counselling, management and improved women's health trajectories.

LIST OF ABBREVIATIONS

AAPEC - Australian Action on Preeclampsia

CH - chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia

CVD - cardiovascular disease

GH - gestational hypertension

GP - general practitioner

HCP - healthcare provider

HDP - hypertensive disorder of pregnancy

ISSHP - International Society for the Study of Hypertension in Pregnancy

PE - preeclampsia

PVD - peripheral vascular disease

SOMANZ - Society of Obstetric Medicine Australia New Zealand

STATEMENTS

Ethical approval

Ethical approval has been provided by South-Eastern Sydney Local Health District Human Research Ethics Committee (Ref: 18/POWH/326). The ratification for the University of Technology Sydney has also been obtained under ETH18-3061.

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Transparency statement and competing interests

The article is the authors' original work, has not received prior publication and is not under consideration for publication elsewhere. All the authors have seen and approved the manuscript being submitted. The manuscript is an honest, accurate, and transparent account of the study being reported, no important aspects of the study have been omitted. We have read and understood BMJ policy on declaration of interests and declare that we have no competing interests. This manuscript presents partial results from Heike Roth's PhD research. The project is supervised by Caroline Homer and Amanda Henry.

Authors contributions

Heike Roth, Amanda Henry and Caroline Homer contributed to the conception and design of the study as well as the distribution of the survey and writing of the manuscript. Heike Roth led the analysis of the survey data, drafting and designed the Tables, Figures and Appendixes and wrote the first draft. Grace LeMarquand was a medical Honours student assisting with pre-survey interviews as well as initial data analysis. Lynne Roberts assisted in the survey development, supported the distribution, the interpretation of the findings and the discussion. Mark Brown contributed to the design of the survey and supported the interpretation of the

findings and the discussion. As a maternity consumer, Lisa Hanley has assisted with the survey design and ensured appropriate use of language and content as well as supported the distribution. All authors contributed to drafts and revising of the paper and all approved the final version.

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Authors' information (optional)

This manuscript presents partial results from Heike Roth's PhD research. The project is supervised by Caroline Homer and Amanda Henry.

Data availability

Data are available upon reasonable request.

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TABLES, SUPPLEMENTARY TABLES, APPENDICES AND FIGURES

Table legend

Table 1: Respondent demographics

Table 2: Means of risk factor knowledge of women listed by type of HDP

Table 3: Proportion of conditions discussed when addressing future risk (multiple answers collected) within and over 3 years since last HDP (summary of collective HDP data)*

Table 4: HDP women's preferences for content and distribution of information/education on future risk after HDP (multiple answers collected) in order of preference

Supplementary data

Supplementary Table 1: Current CVD risk factors of HDP and non-HDP women (Multiple answers collected) in order of frequency

Supplementary Table 2: Chronic Hypertension
a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")
b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

Supplementary Table 3: Diabetes
a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")
b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

Supplementary Table 4: Renal Disease
a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")
b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

Supplementary Table 5: Heart Attack
a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")
b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

Supplementary Table 6: HDP next pregnancy
a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")
b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

Supplementary Table 7: Stroke

a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")
b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

Supplementary Table 8: Heart Disease
a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")
b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

Supplementary Table 9: Peripheral Vascular Disease
a) - Women with HDP likelihood of risk compared to non-HDP ("Do you think you a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")
b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

Supplementary Table 10: Breast Cancer
a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")
b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

Supplementary Table 11: Seizures
a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")
b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

Supplementary Table 12: Proportion of participants scoring 'high', 'moderate' and 'low' by type of HDP and non-HDP

Supplementary Table 13: Means of risk factor knowledge of women with a history of preeclampsia listed by time elapsed since HDP

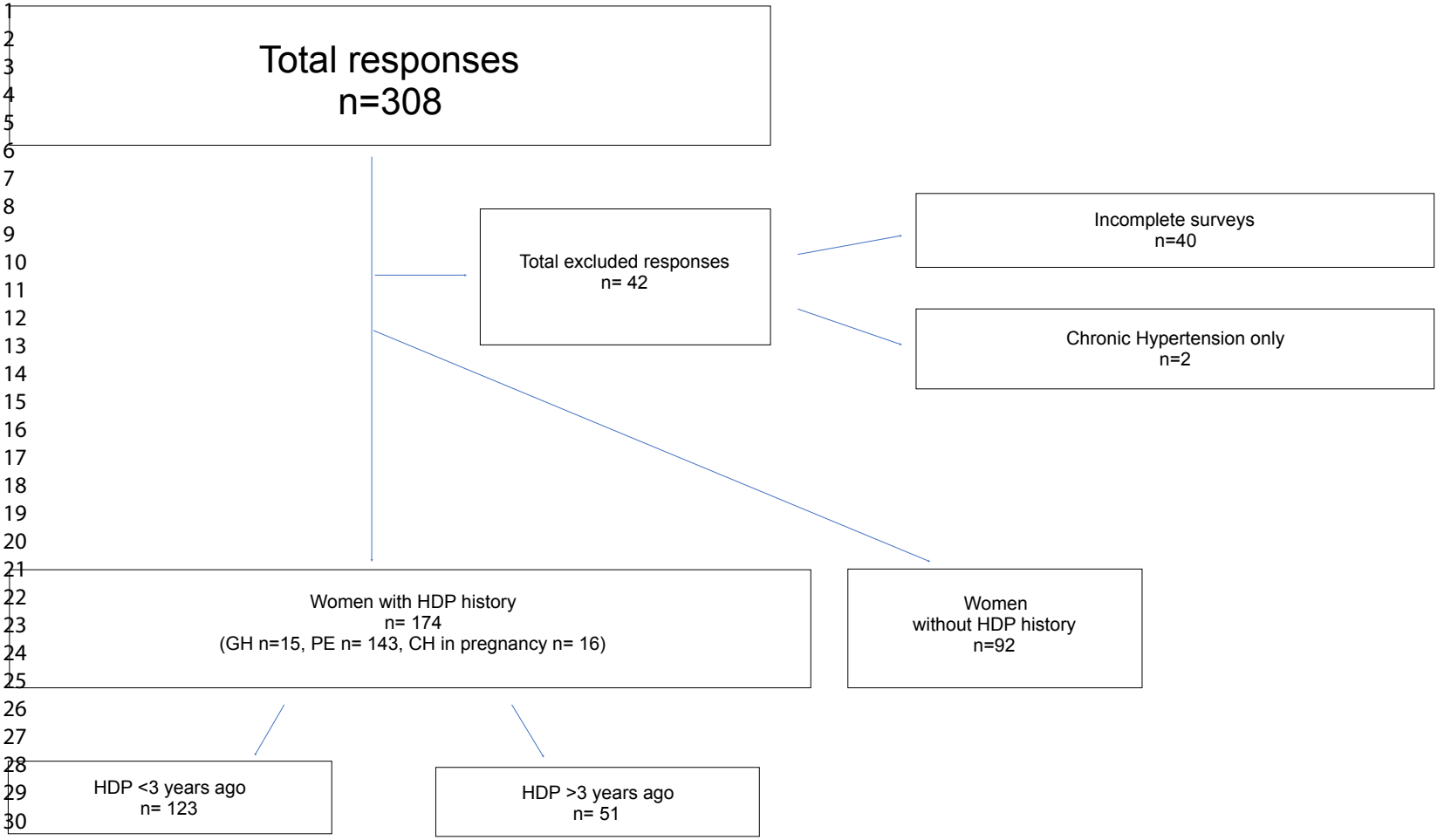
Supplementary Table 14: HDP and non-HDP women's answers to timing of rise of risk with signs and symptoms starting to show

Supplementary Table 15: Proportion of conditions discussed by HDP sub-type when addressing future risk (multiple answers collected) within and over 3 years since last HDP (complements Table 3 which illustrates a summary of this data)

Appendices
Appendix 1: Survey for women

Figure legend
Figure 1: Survey inclusion

Figure 1: Survey Inclusion



HDP- hypertensive disorder of pregnancy, GH - gestational hypertension, PE - preeclampsia, CH in pregnancy - chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia

Supplementary Table 1: Current CVD risk factors of HDP and non-HDP women (Multiple answers collected) in order of frequency

	GH	PE	CH	Total HDP	non-HDP	P HDP vs non HDP
	n=15	n=143	n=16	n=174	n=92	
	n (%)*	n (%)*	n (%)*	n (%)*	n (%)*	
None of the options	6 (40)	52 (36)	2 (13)	60 (34)	57 (62)	<0.001
Obesity	5 (33)	38 (27)	7 (44)	50 (29)	10 (11)	0.001
Family History Heart disease	3 (20)	37 (26)	6 (38)	46 (26)	14 (15)	0.037
Hypertension	3 (20)	30 (21)	12 (75)	35 (20)	0 (0)	<0.001
Renal problems	0 (0)	21 (15)	2 (13)	23 (13)	0 (0)	<0.001
Smoking	0 (0)	10 (7)	3 (19)	13 (7)	2 (2)	0.075
History of cardiovascular event**	0 (0)	1 (1)	0 (0)	1 (1)	0 (0)	0.356
Diabetes	0 (0)	5 (3)	2 (13)	7 (4)	0 (0)	0.014
Alcohol consumption	0 (0)	0 (0)	1 (6)	1 (1)	0 (0)	0.356
High Cholesterol	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	-

*Table represents frequency of each option; percentages add to over 100% as women were asked to select any/all that applied.
**angina, stroke or heart attack
PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

Supplementary Table 2: Chronic Hypertension

a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")

	GH pregnancy n=15	**PE pregnancy n=143**	**CH pregnancy n=16**	**Total n=174**
	n (%)	**n (%)**	**n (%)**	**n (%)**
Less likely	0 (0)	1 (1)	0 (0)	1 (1)
Same likelihood	2 (13)	14 (10)	1 (6)	17 (10)
More likely (correct)	8 (53)	111 (78)	13 (81)	132 (76)
I do not know	5 (33)	17 (12)	2 (13)	24 (14)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

	non-HDP n=92
	n (%)
Less likely (correct)	57 (62)
Same likelihood	22 (24)
More likely	1 (1)
I do not know	12 (13)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

Supplementary Table 3: Diabetes

a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")

	GH pregnancy n=15	PE pregnancy n=143	CH pregnancy n=16	Total n=174
	n (%)	n (%)	n (%)	n (%)
Less likely	0 (0)	1 (1)	0 (0)	1 (1)
Same likelihood	3 (20)	61 (43)	5 (31)	69 (40)
More likely (correct)	4 (27)	35 (25)	5 (31)	44 (25)
I do not know	8 (53)	44 (31)	6 (38)	58 (33)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

	non-HDP n= 92
	n (%)
Less likely (correct)	32 (35)
Same likelihood	39 (42)
More likely	4 (4)
I do not know	17 (19)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

Supplementary Table 4: Renal Disease

a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")

	GH pregnancy n=15	PE pregnancy n=143	CH pregnancy n=16	Total n=174
	n (%)	n (%)	n (%)	n (%)
Less likely	0 (0)	2 (1)	0 (0)	2 (1)
Same likelihood	2 (14)	30 (21)	1 (7)	33 (19)
More likely (correct)	4 (29)	77 (55)	11 (73)	92 (54)
I do not know	8 (57)	32 (23)	3 (20)	43 (25)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

	non-HDP n=92
	n (%)
Less likely (correct)	39 (42)
Same likelihood	31 (34)
More likely	0 (0)
I do not know	22 (24)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

Supplementary Table 5: Heart Attack

a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")

	GH pregnancy n=15	PE pregnancy n=143	CH pregnancy n=16	Total n=174
	n (%)	n (%)	n (%)	n (%)
Less likely	0 (0)	1 (1)	0 (0)	1 (1)
Same likelihood	1 (7)	20 (14)	1 (7)	22 (13)
More likely (correct)	8 (53)	98 (69)	12 (80)	118 (69)
I do not know	6 (40)	23 (16)	2 (13)	31 (18)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

	non-HDP n=92
	n (%)
Less likely (correct)	48 (53)
Same likelihood	23 (25)
More likely	0 (0)
I do not know	20 (22)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

Supplementary Table 6: HDP next pregnancy

a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")

	GH pregnancy n=15	PE pregnancy n=143	CH pregnancy n=16	Total n=174
	n (%)	n (%)	n (%)	n (%)
Less likely	0 (0)	2 (1)	0 (0)	2 (1)
Same likelihood	0 (0)	9 (6)	0 (0)	9 (5)
More likely (correct)	13 (87)	128 (89)	15 (100)	156 (90)
I do not know	2 (13)	4 (3)	0 (0)	6 (4)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

	non-HDP n=92
	n (%)
Less likely (correct)	65 (71)
Same likelihood	19 (21)
More likely	0 (0)
I do not know	8 (9)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

Supplementary Table 7: Stroke

a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")

	GH pregnancy n=15	PE pregnancy n=143	CH pregnancy n=16	Total n=174
	n (%)	n (%)	n (%)	n (%)
Less likely	0 (0)	1 (1)	0 (0)	1 (1)
Same likelihood	1 (7)	18 (13)	1 (7)	20 (12)
More likely (correct)	7 (47)	89 (63)	13 (87)	109 (64)
I do not know	7 (47)	33 (23)	1 (7)	41 (24)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

	non-HDP n=92
	n (%)
Less likely (correct)	49 (53)
Same likelihood	24 (26)
More likely	0 (0)
I do not know	19 (21)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

Supplementary Table 8: Heart Disease

a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")

	GH pregnancy n=15	PE pregnancy n=143	CH pregnancy n=16	Total n=174
	n (%)	n (%)	n (%)	n (%)
Less likely	0 (0)	1 (1)	0 (0)	1 (1)
Same likelihood	2 (13)	18 (13)	1 (7)	21 (12)
More likely (correct)	7 (47)	99 (70)	12 (80)	118 (67)
I do not know	6 (40)	24 (17)	2 (13)	32 (19)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

	non-HDP n=92
	n (%)
Less likely (correct)	46 (50)
Same likelihood	27 (29)
More likely	0 (0)
I do not know	19 (21)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

Supplementary Table 9: Peripheral Vascular Disease

a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")

	GH pregnancy n=15	PE pregnancy n=143	CH pregnancy n=16	Total n=174
	n (%)	n (%)	n (%)	n (%)
Less likely	0 (0)	0 (0)	0 (0)	0 (0)
Same likelihood	2 (13)	20 (14)	1 (7)	23 (13)
More likely (correct)	5 (33)	72 (51)	8 (53)	85 (50)
I do not know	8 (53)	50 (35)	6 (40)	64 (37)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

	non-HDP n=92
	n (%)
Less likely (correct)	41 (45)
Same likelihood	29 (32)
More likely	0 (0)
I do not know	22 (24)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

Supplementary Table 10: Breast Cancer

a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")

	GH pregnancy n=15	PE pregnancy n=143	CH pregnancy n=16	Total n=174
	n (%)	n (%)	n (%)	n (%)
Less likely	0 (0)	0 (0)	0 (0)	0 (0)
Same likelihood (correct)	3 (20)	74 (53)	5 (36)	82 (48)
More likely	1 (7)	1 (1)	1 (7)	3 (2)
I do not know	11 (73)	66 (47)	8 (57)	85 (50)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

	non-HDP n=92
	n (%)
Less likely	6 (7)
Same likelihood (correct)	60 (65)
More likely	1 (1)
I do not know	25 (27)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

Supplementary Table 11: Seizures

a) Women with HDP likelihood of risk compared to non-HDP ("Do you think you have a lower/same/higher chance of getting the following")

	GH pregnancy n=15	PE pregnancy n=143	CH pregnancy n=16	Total n=174
	n (%)	n (%)	n (%)	n (%)
Less likely	0 (0)	0 (0)	0 (0)	0 (0)
Same likelihood (correct)	4 (27)	41 (29)	2 (13)	47 (27)
More likely	1 (7)	41 (29)	4 (27)	46 (27)
I do not know	10 (67)	60 (42)	9 (60)	79 (46)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

b) Women without HDP likelihood of risk compared to HDP ("Do you think you have a lower/same/higher chance of getting the following")

	non-HDP n=92
	n (%)
Less likely	25 (27)
Same likelihood (correct)	40 (44)
More likely	0 (0)
I do not know	27 (29)

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

Supplementary Table 12: Proportion of participants scoring ‘high’, ‘moderate’ and ‘low’ by type of HDP and non-HDP

	GH n=15 n(%)	PE n=143 n(%)	CH n=16 n(%)	P GH vs PE	P GH vs CH	P PE vs CH	HDP n=174 n(%)	non-HDP n=92 n(%)	P HDP vs non- HDP
High (score 8-10)	4 (27)	48 (34)	5 (31)	0.59	0.78	0.67	57 (33)	30 (33)	0.98
Moderate (score 5-7)	3 (20)	52 (36)	7 (44)	0.21	0.16	0.56	62 (36)	25 (27)	0.16
Low (score 0-4)	8 (53)	43 (30)	4 (25)	0.67	0.11	0.85	55 (32)	37 (40)	0.16
Total	15 (100)	143 (100)	16 (100)	-	-	-	174 (101)	92 (100)	-

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy.

The colour coding in addition to the mean scores aims to highlight the areas of ‘low’ (red), ‘moderate’ (orange) and ‘high’ (green) knowledge.

	LOW
	MODERATE
	HIGH

Supplementary Table 13: Means of risk factor knowledge of women with a history of preeclampsia listed by time elapsed since HDP

	PE n=143		PE n=143						PE n=143		
	ALL		0 - 6 month	6 - 12 month	1-2 years	2-3 years	>3 years	P	< 3	> 3	P
			n=26	n=19	n=32	n=20	n=46		n= 97	n= 46	< 3 yrs vs >3 yrs
Chronic Hypertension	0.78		0.77	0.89	0.78	0.80	0.72	0.65	0.80	0.72	0.27
Diabetes	0.24		0.23	0.42	0.31	0.10	0.20	0.14	0.27	0.20	0.35
Renal Disease	0.54		0.50	0.74	0.41	0.65	0.52	0.17	0.55	0.52	0.78
Heart Attack	0.69		0.58	0.89	0.66	0.70	0.67	0.25	0.69	0.67	0.84
Repeat HDP	0.90		0.88	0.89	0.94	0.95	0.85	0.68	0.92	0.85	0.25
Stroke	0.62		0.65	0.68	0.50	0.65	0.65	0.62	0.61	0.65	0.62
Heart Disease	0.69		0.62	0.79	0.63	0.65	0.76	0.50	0.66	0.76	0.21
PVD	0.50		0.54	0.53	0.53	0.40	0.50	0.90	0.51	0.50	0.95
Breast Cancer*	0.52		0.46	0.37	0.63	0.40	0.59	0.25	0.48	0.59	0.26
Seizures*	0.29		0.15	0.16	0.41	0.45	0.26	0.07	0.30	0.26	0.64
OVERALL MEAN KNOWLEDGE SCORE OUT OF 10	**5.8**		**5.4**	**6.4**	**5.8**	**5.8**	**5.7**	0.83	**5.8**	**5.7**	0.89

The colour coding in addition to the mean scores aims to highlight the areas of 'low' (red), 'moderate' (orange) and 'high' (green) knowledge.

MEAN SCORE		
	LOW	0-0.40
	MODERATE	0.41-0.70
	HIGH	0.71-1

Supplementary Table 14: HDP and non-HDP women's answers to timing of rise of risk with signs and symptoms starting to show

	GH	PE	CH	HDP	Non HDP	P
	n=15	n=143	n=16	n=174	n=92	HDP vs non-HDP
	n (%)*	n (%)*	n (%)*	n (%)*	n (%)*	
<10 years	4 (27)	42 (29)	9 (56)	55 (32)	41 (45)	0.036
10-15 years	3 (20)	28 (20)	2 (13)	33 (19)	15 (16)	0.591
16-20 years	0 (0)	13 (9)	0 (0)	13 (8)	1 (1)	0.013
>20 years	3 (20)	5 (4)	0 (0)	8 (5)	2 (2)	0.302
Not sure/don't know	1 (7)	48 (34)	1 (6)	52 (30)	33 (36)	0.319
I don't think I will get any of these as I maintain a healthy lifestyle	4 (27)	7 (5)	2 (13)	13 (8)	N/A	-
TOTAL	15 (101)	143 (101)	16 (101)	174 (102)	92 (100)	

* Percentages may not add to 100% as figures are rounded to whole numbers only

PE = preeclampsia GH = gestational hypertension CH= chronic hypertension worsening in pregnancy and/or with superimposed preeclampsia, HDP= hypertensive disorder of pregnancy

Supplementary Table 15: Proportion of conditions discussed by HDP sub-type when addressing future risk (multiple answers collected) within and over 3 years since last HDP (complements Table 3 which illustrates a summary of this data)

	GH n=15 N (%)		**PE n = 143 N (%)**		**CH n = 16 N (%)**		**Total n = 174 N (%)**		**Overall Total n = 174 N (%)**	**P value < 3 yrs vs >3 yrs**
	<3yrs	**>3yrs**	**<3yrs**	**>3yrs**	**<3yrs**	**>3yrs**	**<3yrs**	**>3yrs**		
HDP next pregnancy	3 (23)	1 (50)	47 (48)	21 (46)	5 (38)	2 (67)	55 (45)	24 (47)	79 (45)	0.78
Chronic Hypertension	4 (31)	1 (50)	47 (48)	16 (35)	4 (31)	2 (67)	55 (45)	19 (37)	74 (43)	0.37
No discussion	**7 (54)**	**1 (50)**	**33 (34)**	**17 (37)**	**5 (38)**	**1 (33)**	**45 (37)**	**19 (37)**	**64 (37)**	**0.93**
Lifestyle changes	4 (31)	-	26 (27)	6 (13)	2 (15)	2 (67)	32 (26)	8 (16)	40 (23)	0.14
Heart Attack	1 (8)	-	20 (21)	6 (13)	1 (8)	1 (33)	22 (18)	7 (14)	29 (17)	0.50
Renal Disease	1 (8)	-	20 (21)	3 (7)	2 (15)	1 (33)	23 (19)	4 (8)	27 (16)	0.07
Stroke	1 (8)	1 (50)	18 (19)	4 (9)	1 (8)	1 (33)	20 (16)	6 (12)	26 (15)	0.45
Peripheral vascular disease	-	-	15 15)	5 (11)	1 (8)	-	16 (13)	5 (10)	21 (12)	0.56
Cannot remember	1 (8)	-	4 (4)	2 (4)	1 (8)	-	6 (5)	2 (4)	8 (5)	0.78

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

LONG TERM HEALTH AFTER BLOOD PRESSURE PROBLEMS IN PREGNANCY

You are invited to take part in a survey to gain insight into what women like yourself who have been pregnant before know about women's heart health. We are interested in the views of all women especially women who had high blood pressure (hypertension) or preeclampsia in pregnancy.

You can complete the survey if you are currently pregnant (with no major issues so far this pregnancy) or have been pregnant in the last three (3) years. You may have experienced high blood pressure in pregnancy OR you may have experienced a pregnancy without any serious complications.

The study is being conducted by the University of NSW, University of Technology Sydney and the Sydney Partnership for Health, Education, Research and Enterprise (SPHERE). The study is being undertaken by:

- **Dr. Amanda Henry - Obstetrician at St George and Royal Hospital for Women, Randwick, Senior Lecturer UNSW and SPHERE member**
- **Distinguished Professor Caroline Homer - UTS, Midwifery Faculty of Health and SPHERE member**
- **Dr. Clare Arnott - Cardiologist, Royal Price Alfred Hospital**
- **Mrs. Heike Roth - PhD Candidate at University of Technology, Sydney**
- **Mrs. Lynne Roberts - Research Midwife at St George Hospital, SESLHD.**

This work is occurring as part of Mrs Heike Roth's PhD studies and the NHMRC Fellowship of Dr. Henry. Apart from salary support for Dr. Henry, the study is otherwise unfunded.

If you agree to take part in this survey, it should only take about 15 minutes to complete and will involve answering questions about you, your pregnancy and your understanding of long term health in women who have been diagnosed with blood pressure problems in pregnancy.

Participation in this study is entirely voluntary and if you do not wish to take part it will have no effect on the care you are currently receiving. If you decide to participate, and throughout the survey think you would like to withdraw/not complete the survey, you can simply stop and not submit your answers. If you have already submitted your survey, it will not be possible to withdraw the data you have provided as the surveys are anonymous.

The information you provide will not be identifiable and will be kept securely until destroyed as per the South East Sydney Local Health District's requirements.

The study results will be published in a research thesis, in peer reviewed journals and presented at conferences and other professional forums. No one will be able to identify you from this information.

If you would like to personally receive results, you will have the option to leave your email details. The results will be available one (1) year after conclusion of the survey and your email will not be used for any other purpose.

If you would like any further information about the study or you experience any distress or concern as a result of completing this survey, please contact the Principal Investigator, Dr Amanda Henry on 02 91132315 or via email Amanda.henry1@health.nsw.gov.au. For medical assistance you can consult your General Practitioner. If you would like further information about the topic addressed in this study, you can visit the Australian Heart Foundation on the following link: https://www.heartfoundation.org.au/your-heart/women-and-heart-disease/womens-stories.

If you have any concerns or complaints about the conduct of this study, you should contact the Research Support Office of the South Eastern Sydney Local Health District Human Research Ethics Committee which is nominated to receive complaints from research participants. You should contact them on 02 9382 3587, or email SESLHD-RSO@health.nsw.gov.au and quote HREC 18/156.

* 1. I acknowledge that participation in the survey is voluntary

☐ Yes

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

ABOUT YOU

These first few questions are to find out about you, your background, and occupation. Questions marked with a green asterisk (*) simply mean that they must be answered in order to continue.

* 2. What age group are you in?

- 18-25
- 26-35
- 36-45
- 46-55
- 56+
- Prefer not to answer

* 3. What ethnic group do you identify with? (Please select one answer)

- Caucasian
- Asian
- Polynesian or Maori
- Aboriginal or Torres Strait Islander
- European
- Prefer not to answer
- Other (please specify)

* 4. What is your highest level of formal education?

- Secondary school
- Trade Certificate/Diploma
- University degree
- Prefer not to answer
- Other (please specify)

5. What is your usual occupation/profession?

* 6. Are you currently in a relationship?

- Yes
- No
- Prefer not to answer

* 7. Where did you hear about this survey?

- P4 Newsletter
- Australian Action on Preeclampsia (AAPEC)
- Tresillian
- Maternity Choices Australia
- Other (please specify)
- Maternity Consumer Network
- Maternity Clinics
- Social media (Facebook, Twitter)
- Australian College of Midwives

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

ABOUT YOUR HEALTH

These next questions are about your general health.
Questions marked with a green asterisk (*) simply mean that they must be answered in order to continue.

* 8. Are you currently pregnant?

- ◯ Yes
- ◯ No
- ◯ Prefer not to answer

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

ABOUT YOUR HEALTH

Questions marked with a green asterisk (*) simply mean that they must be answered in order to continue.

9. How many weeks pregnant are you? (provide whole numbers only, for example: 24)

10. How many children have you given birth to (20 weeks gestation and over)?

* 11. Have you ever had any of the following, whilst pregnant or before or after pregnancy? (select all that apply)

- [ ] High blood pressure
- [ ] High BMI (overweight)
- [ ] Angina
- [ ] Diabetes
- [ ] Kidney problems
- [ ] Other (please specify)
- [ ] Stroke
- [ ] Significant illness
- [ ] Heart attack
- [ ] None of the above/ no significant other medical complication

* 12. From the list below, which currently apply to you? (select all that apply)

- [ ] Smoking
- [ ] Obesity
- [ ] Alcohol consumption
- [ ] Family history of heart disease
- [ ] High cholesterol
- [ ] High blood pressure
- [ ] Diabetes
- [ ] None of the above

Other (please specify)

13. Please provide the details of any prescribed medications you are taking

- ( ) I do not take any prescribed medication
- ( ) I take prescribed medication (please list the medications or leave blank if you prefer not to answer)

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

PREGNANCY

This section is about your pregnancy history.
Questions marked with a green asterisk (*) simply mean that they must be answered in order to continue.

DEFINITIONS OF BLOOD PRESSURE PROBLEMS

Here are some definitions of certain types of blood pressure problems in pregnancy. You may find these useful in order to more easily understand and answer the next questions.

Chronic hypertension: is if you had high blood pressure before falling pregnant, have high blood pressure outside of pregnancy, or were found to already have high blood pressure in the first half of your pregnancy. Chronic hypertension may have no known underlying cause (this is sometimes called "essential" hypertension), or it may be as a result of another underlying condition, such as kidney disease.

Gestational hypertension: is when you might have had high blood pressure for the first time in your pregnancy (after 20 weeks of pregnancy) but were otherwise well (that is, high blood pressure only but no effect on your baby's growth or on your health otherwise).

Preeclampsia: is when you have had high blood pressure in pregnancy (after 20 weeks of pregnancy) and some additional signs or issues in you and/or your baby. For example, you might have had protein in your urine, liver or kidney problems that showed up on blood tests, or there may have been concerns about the growth of your baby while you were pregnant.

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

PREGNANCY

Questions marked with a green asterisk (*) simply mean that they must be answered in order to continue.

We understand that you may find some of the questions difficult to answer as they might remind you of a challenging time in your life. We are grateful for your participation and contribution to improving knowledge on future health for women who had blood pressure problems in pregnancy. You will find some explanations at the end of the survey and a contact, in case you would like to seek further clarification and/or assistance.

* 14. Choose the situation which best describes your pregnancy history

- ◯ At least one pregnancy is/was affected by gestational hypertension
- ◯ At least one pregnancy is/was affected by preeclampsia
- ◯ I have only been diagnosed with chronic hypertension
- ◯ I had chronic hypertension before pregnancy and had/have pregnancies that were complicated further by higher than usual blood pressure
- ◯ I had chronic hypertension before pregnancy and had/have pregnancies that were complicated further by preeclampsia
- ◯ No pregnancy is/was affected

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

YOUR HEALTH DURING YOUR PREGNANCY

Questions marked with a green asterisk (*) simply mean that they must be answered in order to continue.

* 15. As someone who has chronic hypertension are you aware of any long term health issues that you are at risk of? (select all that apply)

- [ ] Diabetes
- [ ] Kidney disease
- [ ] Breast cancer
- [ ] Cardiac death
- [ ] High blood pressure complications in another pregnancy
- [ ] Stroke
- [ ] Peripheral vascular disease
- [ ] Other (please specify)
- [ ] Leukaemia
- [ ] Seizures
- [ ] Overall mortality risk is higher
- [ ] Ischaemic heart disease/heart attack
- [ ] I think there are health risks but unsure which conditions I may be at risk of
- [ ] I do not think that there are increased risks

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

* 16. How many years after blood pressure problems in pregnancy do you think the various signs and symptoms of the potential risks may start to appear?

- ◯ < 10 years after pregnancy
- ◯ 10-15 years after pregnancy
- ◯ 16-20 years after pregnancy
- ◯ Other (please specify)
- ◯ > 20 years after pregnancy
- ◯ Not sure/do not know

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

Chronic Hypertension only -TYPE OF CARE RECEIVED DURING PREGNANCY

Questions marked with a green asterisk (*) simply mean that they must be answered in order to continue.

17. If a healthcare provider did speak to you about your future health risks, when did this occur?

- [ ] Before birth
- [ ] Immediately after birth
- [ ] Within first 6 weeks
- [ ] 6 weeks to 6 months
- [ ] 6 months to 1 year
- [ ] 1 year and over
- [ ] I cannot remember

* 18. When would be a good time to receive information about long term health risks in your gestational hypertension or preeclampsia experience?

During pregnancy/at birth 12 months after birth 24 months after birth

* 19. As a result of your pregnancy affected by blood pressure problems, were you referred to any of the below after your baby was born? (tick all that apply)

- [ ] Cardiologist
- [ ] Renal (kidney) Physician
- [ ] General Practitioner
- [ ] Other (please specify)
- [ ] Fitness centre for exercise
- [ ] Nutritionist for dietary adjustment
- [ ] I cannot remember

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

20. During your pregnancies over the last 3 years (20 weeks pregnancy and over), which blood pressure problem were you diagnosed with?

	Gestational Hypertension	Preeclampsia	No blood pressure problem diagnosed this pregnancy	I cannot remember	Not applicable
First Pregnancy	○	○	○	○	○
Second Pregnancy	○	○	○	○	○
Third Pregnancy	○	○	○	○	○

Any comments?

* 21. How long ago was your most recent pregnancy that was affected by a blood pressure problem?

- ○ 0-6 months
- ○ 6-12 months
- ○ 1-2 years
- ○ 2-3 years
- ○ more than 3 years ago

* 22. At what point in time were you diagnosed? (Choose a most accurate time frame)

	20-28 weeks	28-34 weeks	34-37 weeks	37-40 weeks	40-42 weeks	During or after giving birth	No diagnosis of blood pressure problem this pregnancy	I cannot remember	Not applicable
First Pregnancy	○	○	○	○	○	○	○	○	○
Second Pregnancy	○	○	○	○	○	○	○	○	○
Third Pregnancy	○	○	○	○	○	○	○	○	○

Any comments?

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

PREGNANCY

Questions marked with a green asterisk (*) simply mean that they must be answered in order to continue.

* 23. Did you have a *planned* induction of labour or *planned* caesarean section due to your blood pressure problems?

	Yes, planned induction of labour because of blood pressure issues in pregnancy	Yes, planned caesarean section because of blood pressure issues	Yes, planned caesarean for other reasons than blood pressure	No planned induction and no planned caesarean section	I cannot remember	Not applicable
First Pregnancy	○	○	○	○	○	○
Second Pregnancy	○	○	○	○	○	○
Third Pregnancy	○	○	○	○	○	○

Any Comments?

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

LONG TERM HEALTH RISKS

This section is about some long term health risks that some women may experience after having had blood pressure problems in pregnancy.

For this section we would like you to think about the long-term health risks of a woman who has been diagnosed with high blood pressure in pregnancy.

Not everyone who experienced blood pressure problems in pregnancy will necessarily have health issues in the future. We would not want you to unnecessarily worry about any of these risks, therefore we will provide you with further information about long-term health after high blood pressure in pregnancy at the end of the survey.

* 24. FOR WOMEN **WITH** HISTORY OF BLOOD PRESSURE PROBLEMS IN PREGNANCY:

Compare yourself to a woman who has NOT had blood pressure problems in pregnancy.

Do you think you have a lower/same/higher chance of getting the following:

	Less chance than a woman without blood pressure in pregnancy	Same chance as a woman without blood pressure in pregnancy	Higher chance than a woman without blood pressure in pregnancy	Not sure/I do not know
High blood pressure later in life	○	○	○	○
Diabetes	○	○	○	○
Kidney disease	○	○	○	○
Breast cancer	○	○	○	○
Heart attack	○	○	○	○
High blood pressure in another pregnancy	○	○	○	○
Stroke	○	○	○	○
Heart disease	○	○	○	○
Seizures	○	○	○	○
Vascular Disease	○	○	○	○

If you are concerned by any of the above potentially affecting you, information is available at the end of the survey where risks are explained.

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

For this section we would like you to think about the long term health risks of a woman who has been diagnosed with high blood pressure in pregnancy.

* 25. FOR WOMEN WITHOUT HISTORY OF BLOOD PRESSURE PROBLEMS IN PREGNANCY:

Compare yourself to a woman who HAS had blood pressure problems in pregnancy.

Do you think you have a lower/same/higher chance of getting the following:

	Less chance than a woman with blood pressure in pregnancy	Same chance as a woman with blood pressure in pregnancy	Higher chance than a woman with blood pressure in pregnancy	Not sure/I do not know
High blood pressure later in life	○	○	○	○
Diabetes	○	○	○	○
Kidney disease	○	○	○	○
Breast cancer	○	○	○	○
Heart attack	○	○	○	○
High blood pressure in another pregnancy	○	○	○	○
Stroke	○	○	○	○
Heart disease	○	○	○	○
Seizures	○	○	○	○
Vascular Disease	○	○	○	○

* 26. How many years after blood pressure problems in pregnancy do you think the various signs and symptoms of the potential risks may start to appear?

- ○ < 10 years after pregnancy
- ○ 10-15 years after pregnancy
- ○ 16-20 years after pregnancy
- ○ Other (please specify)
- ○ > 20 years after pregnancy
- ○ Not sure/do not know

If you are concerned by any of the above potentially affecting you, information is available at the end of the survey where risks are explained.

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

* 27. How many years after blood pressure problems in pregnancy do you think the various signs and symptoms of the potential risks may start to appear?

- ◯ < 10 years after pregnancy
- ◯ 10-15 years after pregnancy
- ◯ 16-20 years after pregnancy
- ◯ > 20 years after pregnancy
- ◯ Not sure/do not know
- ◯ I don't think I will get any of these as I maintain a healthy lifestyle
- ◯ Other (please specify)

IN CASE OF DISTRESS

If you experience any distress caused due to the completion of this survey, please contact your GP or the Principal Investigator of this study, Dr Amanda Henry on 02 91132315 or Amanda.henry1@health.nsw.gov.au

For more information on this topic please visit The Australian Heart Foundation on the following link: https://www.heartfoundation.org.au/your-heart/women-and-heart-disease/womens-stories

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

TYPE OF CARE RECEIVED DURING PREGNANCY WHERE A BLOOD PRESSURE PROBLEM WAS DIAGNOSED

Questions marked with a green asterisk (*) simply mean that they must be answered in order to continue.

It is quite likely that some of the following questions may bring back some memories or bring rise to emotions that you find difficult to deal with. Please contact the Principal Investigator, Dr Amanda Henry on 02 91132315 or via email Amanda.henry1@health.nsw.gov.au if you would like to discuss these concerns. For medical assistance you can consult your General Practitioner.

* 28. Have you ever been admitted to a 'High Dependency Unit' or 'Intensive Care Unit' as a result of your blood pressure problem in pregnancy?

- ◯ Yes
- ◯ No
- ◯ I am not sure
- ◯ I cannot remember

* 29. Have any of your babies been admitted to 'Neonatal Intensive Care', 'High Dependancy Unit' or 'Special Care Nursery' as a result of your blood pressure problem in pregnancy?

- ◯ Yes
- ◯ No
- ◯ I am not sure

30. After your baby was born have you had any of the following? (select all that apply)

- ☐ Blood pressure measurement in hospital
- ☐ Blood pressure measurement with my GP
- ☐ Consultation with an obstetrician
- ☐ Consultation with a renal (kidney) specialist
- ☐ Consultation with an obstetric medicine specialist (doctor who specialises in complications of pregnancy like high blood pressure)
- ☐ I cannot remember
- ☐ Other (please specify)

* 31. After your baby was born, did someone speak to you about any of the below future health risks? (select all that apply)

- [ ] Increased risk of high blood pressure
- [ ] Increased risk of kidney problems
- [ ] Increased risk of stroke
- [ ] Increased risk of heart attack
- [ ] Increased risk of vascular disease
- [ ] Other (please specify)
- [ ] Risk of hypertensive disease in your next pregnancy
- [ ] I was told to eat a healthy diet, do some exercise and live normally
- [ ] No risks were discussed
- [ ] I cannot remember

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

TYPE OF CARE RECEIVED DURING PREGNANCY WHEN A BLOOD PRESSURE PROBLEM WAS DIAGNOSED

Questions marked with a green asterisk (*) simply mean that they must be answered in order to continue.

32. If a healthcare provider did speak to you about your future health risks, when did this occur?

- ☐ Before birth
- ☐ Immediately after birth
- ☐ Within first 6 weeks
- ☐ 6 weeks to 6 months
- ☐ 6 months to 1 year
- ☐ 1 year and over
- ☐ I cannot remember

* 33. When would be a good time to receive information about long term health risks in your gestational hypertension or preeclampsia experience?

During pregnancy/at birth 12 months after birth 24 months after birth

* 34. As a result of your pregnancy affected by blood pressure problems, were you referred to any of the below after your baby was born? (tick all that apply)

- ☐ Cardiologist
- ☐ Renal (kidney) Physician
- ☐ General Practitioner
- ☐ Other (please specify)
- ☐ Fitness centre for exercise
- ☐ Nutritionist for dietary adjustment
- ☐ I cannot remember

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

EDUCATION

In this section we would like to find out about your preferred ways of getting information about long term health after gestational hypertension and preeclampsia.

Questions marked with a green asterisk (*) simply mean that they must be answered in order to continue.

* 35. After experiencing gestational hypertension or preeclampsia what do you want to know about your long term health? (select all that apply)

- [ ] Risk reduction for subsequent pregnancies
- [ ] Reducing risk behaviours (eg. diet, exercise, smoking cessation)
- [ ] Statistics (eg. increased risk)
- [ ] At what point does the risk increase
- [ ] Signs and Symptoms
- [ ] Where to find information
- [ ] How to discuss the matter with my healthcare provider
- [ ] Impact on my children from the pregnancy affected by blood pressure problems
- [ ] Other (please specify)

* 36. How do you want to receive the information? (select all that apply).

- [ ] Key organisations addressing heart health (e.g. The Australian Heart Foundation or Her Heart)
- [ ] Social Media channels (e.g. Instagram, Facebook, Twitter)
- [ ] Brochures/Flyers
- [ ] Medical Professionals
- [ ] Podcasts/Media
- [ ] Online videos
- [ ] Other (please specify)

37. Is there anything else you would like to tell us?

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

POST-SURVEY OPTIONS AND SUMMARY OF RISK PROFILE

Some further things we would like you to consider:

38. We would like to have your opinion on what you think would be appropriate education material to improve women's knowledge. We would also like to know how the education could best be distributed to women. Would you like to participate in a **focus group** (one off - 2hrs max at St George Hospital, Sydney) or a **telephone interview** (one off 30 mins max)? By involving 'consumers', meaning women like you, the education package will have added value.

If you are interested in participate in either, you can leave your details here.

Name

Email Address

Phone Number

39. Please leave your email address to **receive results** from this study (in approx. 1 year). Your details will not be used for any other purpose.

Email Address

IN CASE OF DISTRESS

If you experience any distress caused due to the completion of this survey, please contact your GP or the Principal Investigator of this study, Dr Amanda Henry on 02 91132315 or Amanda.henry1@health.nsw.gov.au

For more information on this topic please visit The Australian Heart Foundation on the following link:
https://www.heartfoundation.org.au/your-heart/women-and-heart-disease/womens-stories

LONG TERM HEALTH RISKS AFTER HIGH BLOOD PRESSURE IN PREGNANCY - Survey for women

RISK PROFILE - LONG TERM RISKS AFTER BLOOD PRESSURE PROBLEMS IN PREGNANCY EXPLAINED

You may like to take a screenshot of the risk profile so you can refer back to it whenever you need to.

RISK PROFILE

Although most women will experience good long-term health after having high blood pressure in pregnancy, there are, unfortunately, some long term health risks associated with having had high blood pressure in pregnancy.

Women who have had high blood pressure during pregnancy are about 3 to 4 times more likely to develop chronic hypertension than women who did not have a blood pressure problems in pregnancy. They are also about twice as likely to get diabetes in later life, even if they did not have diabetes during pregnancy.

Blood pressure diseases are also more likely to happen in the next pregnancy to women who have already had a previous blood pressure problems in pregnancy compared to women who have not. Therefore, if they have had a pregnancy with blood pressure problems, it is important to be seen early in their next pregnancy. There are treatments that can decrease the chance of recurring problems.

Women are also more likely to get various forms of cardiovascular disease (heart disease, stroke, vascular disease) if they have had gestational hypertension, preeclampsia and/or chronic hypertension. All of these cardiovascular problems are about twice as likely to eventually happen to a woman who has had blood pressure problems in pregnancy compared to a woman who has not. This still means most women will not have heart disease or diabetes after having high blood pressure in pregnancy, especially if they can avoid risk factors like smoking or excessive weight gain, and maintain a healthy diet and exercise.

Kidney problems are about 5 to 10 times more common after preeclampsia in particular. Although the relative risk of developing kidney problems is substantially higher after preeclampsia, the absolute risk of long-term kidney disease is still low. Unless the woman already had a kidney problem, well over 90% of women after preeclampsia and gestational hypertension will not have a kidney problem.

Fortunately, although seizures may occur as a result of preeclampsia during pregnancy, women have no higher long term risk of seizures compared to women who did not have a complicated pregnancy. There is no increased risk of getting cancer (e.g. breast cancer, leukaemia) after having high blood pressure in pregnancy.

For all the long term health risks, these start to go up within 10 years after an affected pregnancy and are ongoing after that. Therefore, it is recommended that women attend regular blood pressure checks with their GP and discuss any changes they can make to improve their general health. For more general information about heart health and managing health risks, please visit the National Heart Foundation website: https://www.heartfoundation.org.au/your-heart/know-your-risks

THANK YOU FOR YOUR PARTICIPATION

STROBE Statement—

Assessing Australian women's knowledge and knowledge preferences about long-term health after hypertensive disorders of pregnancy: a survey study

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-5
Objectives	3	State specific objectives, including any prespecified hypotheses	2
Methods			
Study design	4	Present key elements of study design early in the paper	2& 5-8
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	2&6
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	5-6
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	-
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	-
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	-
Bias	9	Describe any efforts to address potential sources of bias	2& 21-22
Study size	10	Explain how the study size was arrived at	5-6 &Fig1
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7-8
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	7-8
		(*b*) Describe any methods used to examine subgroups and interactions	
		(*c*) Explain how missing data were addressed	
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed	

Case-control study—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	
(*e*) Describe any sensitivity analyses	

Continued on next page

Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	5&6
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	Fig 1
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8-9 Tab1
		(b) Indicate number of participants with missing data for each variable of interest	8
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	
		Cross-sectional study—Report numbers of outcome events or summary measures	
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	
		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	8-14 Tables 2-4
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	20-22
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14-19
Generalisability	21	Discuss the generalisability (external validity) of the study results	22
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	24

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.