International Journal of Reproduction, Contraception, Obstetrics and Gynecology
Azad R et al. Int J Reprod Contracept Obstet Gynecol. 2025 Jun;14(6):1902-1907
www.ijrcog.org
pISSN 2320-1770 | eISSN 2320-1789

DOI: https://dx.doi.org/10.18203/2320-1770.ijrcog20251582

Original Research Article

Prevalence of hypertension among females with infertility, and its association with demographics

Renu Azad[1]*, Richa Rathoria[1], Ekta Chaudhary[1], Vishi Rawat[1], Priya Singh[2]

[1]Department of Obstetrics and Gynaecology, Hind Institute of Medical Sciences Sitapur, Uttar Pradesh, India
[2]Department of Obstetrics and Gynaecology, Rajshree Medical College, Bareilly, Uttar Pradesh, India

Received: 21 April 2025
Accepted: 14 May 2025

***Correspondence:**
Dr. Renu Azad,
E-mail: renuraje2901@gmail.com

ABSTRACT

Background: Hypertension (HTN) is a major health problem accelerating worldwide, particularly among reproductive-age females. It may impair fertility through hormonal and vascular mechanisms. This study assesses the prevalence of HTN among females with infertility and its association with demographic and lifestyle factors.
Methods: A cross-sectional study was conducted over 12 months in the obstetrics and gynaecology department at Hind institute of medical sciences, Sitapur. A total of 384 infertile females aged 18-49 years were included. A predesigned proforma was used to gather demographic, dietary, and anthropometric data, as well as blood pressure (BP) measurements. The 2017 ACC/AHA guidelines were used to classify HTN. SPSS version 22 was used for the statistical analysis.
Results: The mean age of infertile females was 27.87 (6.58) years. The prevalence of HTN among infertile females was 33.1%. Overweight and obesity were present in 40.9% and 20.8% of participants, respectively. HTN was significantly associated with obesity ($p<0.0001$) and higher socioeconomic status ($p=0.016$). No significant associations were found with age, religion, family type, livelihood, type of infertility, diet, or junk food intake.
Conclusions: A high burden of HTN was observed among infertile women, particularly those with obesity and higher socioeconomic backgrounds. Integration of cardiovascular screening and lifestyle interventions into infertility care is essential.

Keywords: Blood pressure, BMI, Hypertension, Infertility, Obesity, Prevalence, Socioeconomic status

INTRODUCTION

Infertility, defined by the world health organization (WHO) as the inability to conceive after 12 months or more of regular unprotected sexual intercourse, affects approximately 15% of couples worldwide.[1] Primary infertility occurs when a female has never become pregnant, whereas secondary infertility occurs when a female has become pregnant at least once.[1] Female factors contribute to nearly half of these cases of infertility and are influenced by various physiological, lifestyle, and comorbid conditions.[2] One such comorbidity gaining attention in recent literature is HTN.[3] The increasing burden of non-communicable diseases (NCDs), including HTN, particularly among women of reproductive age, necessitates a closer examination of their role in reproductive health.

HTN has been linked to impaired reproductive function through mechanisms such as endothelial dysfunction, chronic inflammation, and hormonal imbalances, all of which may negatively affect ovulatory function, implantation, and uterine receptivity.[4] Additionally, the psychological stress associated with infertility may contribute to elevated BP, creating a bidirectional relationship between the two conditions.[5]

The 2017 American college of cardiology/American heart association (ACC/AHA) HTN guidelines provide updated classifications for BP levels.[6] According to these:

Elevated BP: Systolic BP 120-129 mm Hg and diastolic BP <80 mm Hg.[6]

Stage I HTN: Systolic BP 130-139 mm Hg or diastolic BP 80-89 mm Hg.[6]

Stage 2 HTN: Systolic BP ≥140 mm Hg, or diastolic BP of ≥90 mm Hg.[6]

These definitions are based on office (clinic) BP measurements, and may vary for home or ambulatory monitoring.[6] Accurate diagnosis and management require standardized techniques to ensure reliability and consistency.[6]

According to the national family health survey-5 (NFHS-5) carried out in India from 2019 to 2021, 21.3% of females aged 15 and older had elevated BP, compared to 19% in the NFHS-4 (2015-16).[7] The prevalence of HTN in males was 24% in NFHS-5, which was higher than compared of females.[7] Adolescent fertility rate (expressed in terms of births per 1,000 women aged 15-19) for women aged 15-19 years in India was 43 in NFHS-5, as compared to 51 in NFHS-4.[7]

Dual burden of infertility and HTN is particularly significant due to rapid urbanization, dietary changes, sedentary lifestyles, and increasing obesity.[8] Despite this, limited research addressed prevalence of HTN in infertile women and its association with sociodemographic factors.

This study aims to evaluate the prevalence of HTN among infertile females attending a tertiary care infertility clinic in Northern India, and to assess its correlation with socio-demographic variables, dietary patterns, and BMI. Findings may guide integrated approaches to improve both reproductive and cardiovascular outcomes in this vulnerable population.

METHODS

Study design and settings

This cross-sectional study was done in the department of obstetrics and gynaecology, Hind institute of medical sciences, Sitapur, over 12 months after obtaining ethical approval from the Institute's ethical committee and informed consent from participants.

Inclusion criteria

Women aged 18-49 years with clinically diagnosed primary or secondary infertility were included.

Exclusion criteria

Women currently on antihypertensive medications or with a history of diagnosed HTN before infertility diagnosis, patients with pre-existing systemic illnesses such as diabetes mellitus, chronic kidney disease, thyroid disorders, or autoimmune diseases and women with psychiatric disorders or on psychotropic medications that could affect BP were excluded.

Sampling

A convenient sampling method was used. The sample size was calculated using Cochrane's formula by anticipating the prevalence (p) of infertility among women with infertility attending an infertility clinic as 50%, a 95% confidence level, and a 5% margin of error (e).[9]

$N=Z^2\ (p\times q)/e^2$

Where, Z=1.96, p=0.5, q=1-p=0.5, e=0.05

$N=(1.96)^2\times(0.5\times0.5)/(0.05)^2=348.16\approx384$

The final sample size was 384 cases.

Data collection procedure

A predesigned proforma was used for data collection, which included the demographic parameters, dietary history, anthropometric parameters, and BP. Demographic parameters included age, religion, type of family, socioeconomic status (adapted from modified Kuppuswamy socioeconomic status scale, 2023), livelihood, and type of infertility, i.e., primary or secondary.[10] Dietary history included type of diet, i.e., vegetarian or non-vegetarian, and junk food intake frequency, i.e., daily, 1-2 times/week/once a month. Anthropometric measurements comprised weight in kilograms (kg) and height in metres (m). Body mass index (BMI) was calculated by dividing weight in kilograms by height in metres squared (kg/m^2). As per centers for disease control and prevention (CDC), adult BMI Categories are classified as follows:[11] BMI <18.5 kg/m^2: underweight, BMI 18.5-24.9 kg/m^2: normal, BMI ≥25 kg/m^2: overweight and BMI ≥30 kg/m^2: obese.

Statistical analysis

A Microsoft excel document sheet was used to enter the data. Data analysis (mean, standard deviation, frequency, percentages, chi-square test) was done using SPSS software version 22. A $p<0.05$ was considered significant.

RESULTS

Infertile females under study had a mean age of 27.87 years (6.58). Sociodemographic characteristics and dietary habits of infertile females are summarized in Table 1. The mean weight, height, and BMI were 62.4 (10.5) kg, 1.6 (0.7) m, and 25.6 (4.5) kg/m^2. Majority of females were overweight (157, 40.9%) and obese (80, 20.8%) (Table 2). The prevalence of HTN in females with infertility was 33.1% (Figure 1). The mean systolic and diastolic BP were 123.8 (12.7) and 78.9 (7.2) mmHg, respectively. Table 3 shows association of HTN with sociodemographic,

dietary, and anthropometric parameters of infertile females (n=384). A significant association was found between hypertensive females with infertility and upper socioeconomic status (p=0.016), and obesity (p<0.0001).

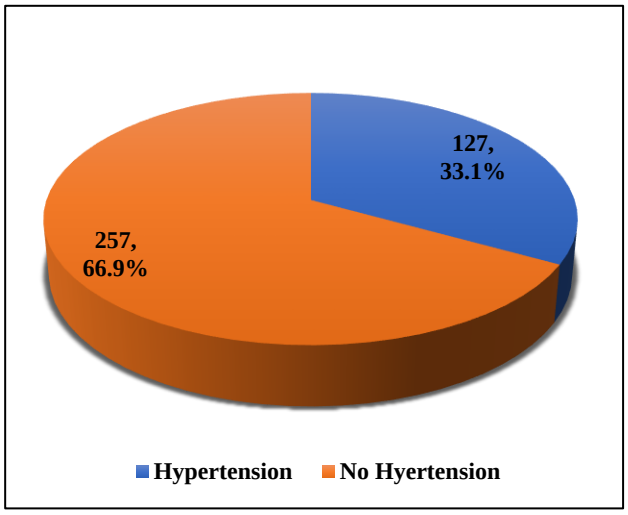

Figure 1: Distribution of infertile females based on HTN, (n=384)

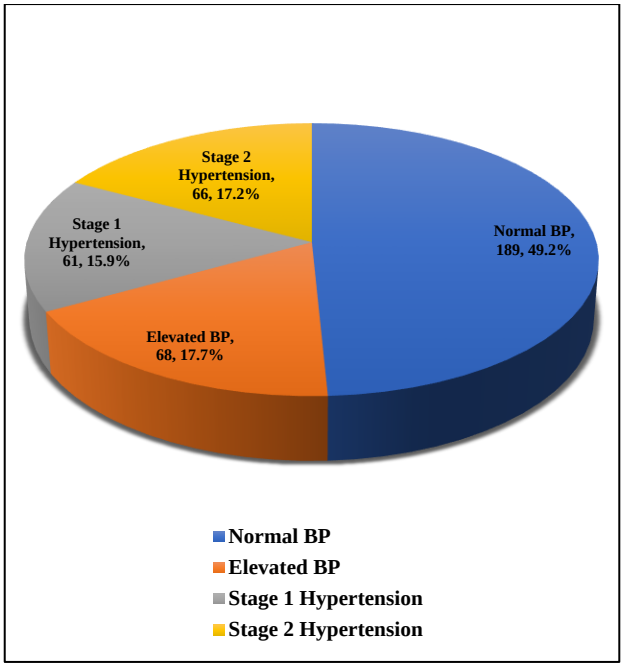

Figure 2: Distribution of infertile females according to BP staging, (n=384).

Table 1: Sociodemographic characteristics and dietary habits of infertile females, (n=384).

Parameters		N	Percentage (%)
Age (in years)	18-33	301	78.4
	34-49	83	21.6
Religion	Hindu	269	70
	Muslim	89	23.2
	Others	26	6.8
Family type	Nuclear	222	57.8
	Joint	162	42.2
Livelihood	Rural	252	65.6
	Urban	132	34.4
Socioeconomic status	Lower	106	27.6
	Upper lower	144	37.5
	Lower middle	93	24.2
	Upper middle	27	7
	Upper	14	3.6
Type of infertility	Primary	305	79.4
	Secondary	79	20.6
Type of diet	Vegetarian	257	66.9
	Non-vegetarian	127	33.1
Junk food intake	Daily	86	22.4
	1-2 times or week	213	55.5
	Once a month	85	22.1

Table 2: Distribution of infertile females based on BMI, (n=384).

BMI categories		N	Percentage (%)
BMI <18.5 kg/m^2	Underweight	26	6.8
BMI 18.5-24.9 kg/m^2	Normal	121	31.5
BMI ≥25 kg/m^2	Overweight	157	40.9
BMI ≥30 kg/m^2	Obese	80	20.8

Table 3: Association of HTN with sociodemographic characteristics, dietary habits, and BMI of infertile females, (n=384).

Parameters		HTN		Chi-square test value	P value
		Yes	No		
Age (in years)	18-33	105	196	2.063	0.151
	34-49	22	61		
Religion	Hindu	89	180	1.508	0.471
	Muslim	32	57		
	Others	6	20		
Family type	Nuclear	74	148	0.016	0.899
	Joint	53	109		
Livelihood	Rural	83	169	0.006	0.937
	Urban	44	88		
Socioeconomic status	Lower	28	78	12.154	0.016
	Upper lower	56	88		
	Lower middle	23	70		
	Upper middle	14	13		
	Upper	6	8		
Type of infertility	Primary	105	200	1.227	0.268
	Secondary	22	57		
Type of diet	Vegetarian	81	176	0.849	0.357
	Non-vegetarian	46	81		
Junk food intake	Daily	28	58	0.244	0.885
	1-2 times/week	69	144		
	Once a month	30	55		
BMI categories	Underweight	4	22	35.298	<0.0001
	Normal	18	103		
	Overweight	70	87		
	Obese	35	45		

Table 4: Association of different stages of BP with sociodemographic characteristics, dietary habits, and BMI of infertile females, (n=384).

Parameters		Normal BP	Elevated BP	Stage 1 HTN	Stage 2 HTN	Chi-square test value	P value
Age (in years)	18-33	145	51	49	56	2.533	0.469
	34-49	44	17	12	10		
Religion	Hindu	131	49	42	47	4.059	0.669
	Muslim	43	14	14	18		
	Others	15	5	5	1		
Family type	Nuclear	106	42	32	42	2.301	0.512
	Joint	83	26	29	24		
Livelihood	Rural	125	44	38	45	0.539	0.910
	Urban	64	24	23	21		
Socioeconomic status	Lower	53	25	14	14	19.196	0.084
	Upper lower	66	22	25	31		
	Lower middle	55	15	11	12		
	Upper middle	9	4	6	8		
	Upper	6	2	5	1		
Type of infertility	Primary	145	55	54	51	4.213	0.239
	Secondary	44	13	7	15		
Type of diet	Vegetarian	127	49	36	45	2.587	0.460
	Non-vegetarian	62	19	25	21		
Junk food intake	Daily	45	13	13	15	2.284	0.892
	1-2 times/ week	101	43	34	35		
	Once a month	43	12	14	16		

Continued.

Parameters		Normal BP	Elevated BP	Stage 1 HTN	Stage 2 HTN	Chi-square test value	P value
BMI categories	Underweight	17	5	1	3	38.378	<0.0001
	Normal	71	32	8	10		
	Overweight	65	22	35	35		
	Obese	36	9	17	18		

DISCUSSION

The purpose of this study was to estimate the prevalence of HTN in infertile women and investigate possible associations it may have with demographic and lifestyle factors. The findings highlight a notable burden of elevated BP in this population, reinforcing the emerging recognition of HTN as a significant comorbidity in reproductive-age women.

The prevalence of HTN in females with infertility in our study was 33.1%. In the present study, a substantial proportion of infertile females (195, 50.8%) exhibited either elevated BP (68, 17.7%) or were classified as stage 1 HTN (61, 15.9%) or stage 2 HTN (66, 17.2%) (Figure 2). Likewise, Mahalingaiah et al reported a prevalence of HTN in 18.8% of infertile females.[12]

Among infertile females, there was no significant association reported of HTN with age (p=0.151), religion (p=0.471), family type (p=0.899), livelihood (p=0.937), type of infertility (p=0.268), type of diet (p=0.357), and junk food intake (p=0.885) while a significant association was reported of HTN with upper socioeconomic status (p=0.016), and being overweight and obese (p<0.0001) in the present study (Table 3). In our study, an increasing trend in BP was observed with rising BMI, aligning with global evidence that obesity plays a pivotal role in both HTN and infertility through insulin resistance, chronic inflammation, and hormonal dysregulation.[4,13]

There was no significant association of different stages of BP with different sociodemographic characteristics (p>0.05) and dietary habits (p>0.05) of infertile females in the present study, except for overweight and obesity (p<0.0001) (Table 4). Different studies by Navaneethabalakrishnan et al and Dag et al also reported similar findings.[4,13]

Pathare et al study revealed that increasing age can contribute to female infertility and *in vitro* fertilization (IVF) failures by impairing endometrial function.[14] Luo et al study significantly reported an inverse association between female infertility and cardiovascular health.[15] This may reflect age-related vascular changes and diminished reproductive capacity, further complicated by elevated cardiovascular risk.[14,15] Kaneria et al reported no significant association of infertility with religion in total and urban areas, but infertility is significantly impacted by religion in rural places; this may be because religious variations in education and marriage age still exist in these rural locations.[16] Chandra et al found a significant association of primary infertility with females living in nuclear families and higher socioeconomic status.[17]

Obesity prevalence has tripled from 1975-2016 globally, and it has more than doubled between 1990 and now.[18,19] Lifestyle and dietary habits such as high salt intake, sedentary behaviour, and poor dietary diversity also emerged as important contributors to infertility.[20,21] These modifiable factors offer critical points for intervention, particularly in low-resource settings where access to specialized reproductive or cardiovascular care may be limited.[20,21] Similar findings have been reported in studies conducted in both developed and developing countries, underscoring global relevance of early screening and integrated care for women with infertility.[17,20-22]

Importantly, this study supports the call for incorporating routine BP screening into infertility workups. Early identification and management of HTN may not only improve long-term cardiovascular outcomes but could also enhance fertility potential by addressing underlying pathophysiological mechanisms.

However, the study is limited by its cross-sectional design, restricting causal inference. Additionally, the reliance on clinic-based BP measurements may not account for white-coat/masked HTN. Despite these limitations, the study contributes valuable regional data and advocates for multidisciplinary approaches to female infertility management.

CONCLUSION

The prevalence of HTN in females with infertility was 33.1% in this study, highlighting a significant prevalence of HTN among women presenting with infertility, underscoring the interplay between reproductive and cardiovascular health. A strong association was observed between hypertensive infertile females with higher BMI and upper socioeconomic status. These findings emphasize the need to recognize HTN as a potentially modifiable risk factor in the clinical evaluation of infertile women. By adopting a comprehensive approach that includes cardiovascular risk assessment alongside infertility evaluation, healthcare providers can improve both fertility outcomes and long-term health prospects for women of reproductive age.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Infertility. (n.d.). Who.int. Available at: https://www.who.int/news-room/fact-sheets/detail/infertility. Accessed on 10 April 2025.
2. Deshpande PS, Gupta AS. Causes and prevalence of factors causing infertility in a public health facility. J Human Reproduct Sci. 2019;12(4):287-93.
3. Farland LV, Grodstein F, Srouji SS, Forman JP, Rich-Edwards J, Chavarro JE, et al. Infertility, fertility treatment, and risk of hypertension. Fertil Steril. 2015;104(2):391-7.
4. Navaneethabalakrishnan S, Goodlett BL, Lopez AH, Rutkowski JM, Mitchell BM. Hypertension and reproductive dysfunction: a possible role of inflammation and inflammation-associated lymphangiogenesis in gonads. Clin Sci. 2020;134(24):3237-57.
5. Rooney KL, Domar AD. The relationship between stress and infertility. Dialogues Clin Neurosci. 2018;20(1):41-7.
6. Carey RM, Whelton PK, 2017 ACC/AHA Hypertension Guideline Writing Committee. Prevention, detection, evaluation, and management of high blood pressure in adults: synopsis of the 2017 American College of Cardiology/American Heart Association Hypertension Guideline. Anna Internal Med. 2018;168(5):351-8.
7. National Family Health Survey (NFHS-5) 2019-21. Compendium of fact sheets. 2021.
8. India. MOHFW. Gov.In. Available at: https://mohfw.gov.in/sites/default/files/NFHS-5_Phase-II_0.pdf. Accessed on 10 April 2025.
9. Silvestris E, De Pergola G, Rosania R, Loverro G. Obesity as disruptor of the female fertility. Reproduct Biol Endocrinol. 2018;16(1):1-3.
10. Cochran's sample size formula p variable meaningand intuition. Cross Validated. Available at: https://stats.stackexchange.com/questions/443708/cochrans-sample-size-formula-p-variable-meaning-and-intuition. Accessed on 10 April 2025.
11. Dalvi T, Kalghatgi S. A 2023 update of Kuppuswamy socioeconomic status classification scale for the Indian population. J Indian Assoc Public Health Dentistr. 2023;21(3):282-3.
12. CDC. Adult BMI categories. BMI. https://www.cdc.gov/bmi/adult-calculator/bmi-categories.html. Accessed on 10 April 2025.
13. Mahalingaiah S, Sun F, Cheng JJ, Chow ET, Lunetta KL, Murabito JM. Cardiovascular risk factors among women with self-reported infertility. Fertil Res Pract. 2017;3:1-7.
14. Dağ ZÖ, Dilbaz B. Impact of obesity on infertility in women. J Turk German Gynecological Assoc. 2015;16(2):111.
15. Pathare AD, Loid M, Saare M, Gidlöf SB, Zamani Esteki M, Acharya G, Peters M, Salumets A. Endometrial receptivity in women of advanced age: an underrated factor in infertility. Human Reprod. 2023;29(6):773-93.
16. Luo M, Li J, Xiao X, Wu P, Zhang Y. Associations between cardiovascular health and female infertility: A national population-based study. Plos One. 2024;19(7):e0306476.
17. Kaneria A, Dipika Kumari Bhoya N, Patel M, Palak Kaneriya A. Association between Infertility and Educated Working Women: Evidences from Indian Data. ESS Open Archive. 2024;892:89231025.
18. Chandra DN, Singh N. Study on prevalence and demographic factors associated with primary infertility in a tertiary care centre in North India. J Cardiovascular Dis Res. 2023;14(11):140-5.
19. Rathoria E, Rathoria R, Bansal U, Agarwal A. Prevalence of overweight and obesity in adolescents from eastern Uttar Pradesh. Int J Scient Res. 2021;10(1):49-51
20. Singh A, Rathoria E, Singh SK, Rathoria R, Yadav SK, Bansal U. Prevalence of overweight and obesity, and associations with socio-demographic and etiological factors. Int J Contemp Pediatr. 2024;11(10):1400-5.
21. Al-Jawaldeh A, Abbass MM. Unhealthy dietary habits and obesity: the major risk factors beyond non-communicable diseases in the eastern mediterranean region. Front Nutrition. 2022;9:817808.
22. Emokpae MA, Brown SI. Effects of lifestyle factors on fertility: practical recommendations for modification. Reprod Fertil. 2021;2(1):R13-26.
23. ACOG committee opinion no. 762: Prepregnancy counseling: Prepregnancy counseling. Obstetr Gynecol. 2019;133(1):e78-89.

Cite this article as: Azad R, Rathoria R, Chaudhary E, Rawat V, Singh P. Prevalence of hypertension among females with infertility, and its association with demographics. Int J Reprod Contracept Obstet Gynecol 2025;14:1902-7.