

## Original Research Article

# A study on the prevalence of hypertension and its associated risk factors in Gandhinagar urban PHC, Jaipur

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## ABSTRACT

**Background:** Hypertension is considered as an important public health issue around the world. It is associated with the development of more serious medical conditions like myocardial infarction, cardiac failure, stroke, renal disease, etc. According to the WHO, high blood pressure affects 1280 million adults aged 30 to 79 years worldwide and almost two-thirds of them come from low-middle-income countries.

**Methods:** An OPD-based, observational study was conducted among individuals aged 30 years or above at Gandhinagar UPHC of Jaipur city in the state of Rajasthan. Prevalence of hypertension and prehypertension were analysed. The details regarding gender, age, family history of individuals and other behavioural characteristics like tobacco, smokeless tobacco and alcohol consumption, physical activity, and anthropometric measurements were collected. The Chi-square test was applied to analyze if a statistically significant association exist between hypertension and the above-mentioned factors.

**Results:** This study estimated hypertension prevalence as 23.2%. The prevalence of prehypertension was estimated to be 33.2% and the prevalence of individuals with no-hypertension was 43.6%. This study also reports that obesity, consumption of alcohol, smoking and positive HTN family history were significant determinants for hypertension.

**Conclusions:** Overall, the results of this study show that the HTN and pre-HTN prevalence was significant in the study population. In the absence of lifestyle changes, individuals referred to as prehypertensive are at high risk of developing HTN. Early detection and timely intervention will reduce the effect of high BP thus decreasing the risk of developing CVDs, stroke, and renal impairment.

**Keywords:** Hypertension, High blood pressure, Prevalence, Awareness, Risk factors, Non-communicable disease

## INTRODUCTION

### *Hypertension status globally*

HTN is a pathological condition characterised by abnormally high arterial blood pressure.<sup>1-4</sup> It is regarded as one of the major public health issues globally.<sup>5</sup> The hypertension prevalence is increasing rapidly in countries in the developing phase.<sup>5</sup> HTN is associated with the

development of more serious medical conditions like myocardial infarction, cardiac failure, stroke, and renal disease.<sup>5</sup> According to GBD-2015 hypertension led to 33.9 million DALYs and around 1.6 million deaths and so is considered a very important cause of mortality.<sup>6</sup> In 2017, there were 208 million disability-adjusted life years attributed to hypertension worldwide.<sup>7</sup> Over the last twenty years, the burden of hypertension has shifted from high-and-middle-income countries (HMIC) to low-and-

middle-income-countries (LMIC), owing to a variety of factors including rapid urbanization, economic development, increasing elderly population, sedentary lifestyle, dietary changes, and an increase in the life expectancy.<sup>7,4</sup> According to the WHO, hypertension affects 1280 million adults aged 30 to 79 years globally and almost two-thirds of them belong to low and middle-income countries (LMIC).<sup>8</sup>

### ***Hypertension status in India***

The prevalence of HTN is worrisome in India and accounts for 10.8% of all deaths in the country as per Kurjogi et al.<sup>5</sup> It is a major determinant for increasing the burden of chronic disease in India.<sup>9-12</sup> There are around 207 million hypertensive people in India as per the fourth district level household survey.<sup>12</sup> According to a study by Ramakrishnan et al a nationwide survey was conducted in India's 24 states and UTs in the year 2015.<sup>9</sup> In this study, blood pressure was recorded for 180,335 people and overall hypertension prevalence was found to be 30.7%.<sup>9</sup> The study also concluded that almost one in every three Indian adults suffers from hypertension.<sup>9</sup> Hypertension is related to 57% of strokes and 24% of deaths related to coronary artery.<sup>10</sup> As per the study by Prabhakaran et al Indians are impacted by CVDs ten years earlier in their mid-life as compared to the European people.<sup>11</sup> Around 52% of total cardiovascular disease-related deaths occur below 70 years of age in India and this is comparatively very low (23%) for the western population.<sup>11</sup> A systematic review with meta-analysis was done for various studies conducted in different parts of India by Anchala et al.<sup>10</sup> According to the study, the overall hypertension prevalence in India was 29.8%.<sup>10</sup> The study also showed a difference in the prevalence of HTN, which was 27.6% in the rural population and 33.8% in the urban population.<sup>10</sup> However, as a result of dietary and lifestyle changes, this gap is gradually narrowing down.<sup>10</sup>

There are very few studies conducted on hypertension prevalence in north India and especially in the state of Rajasthan. A study by Geldsetzer et al found the prevalence of HTN to be 18.3% in the rural parts of Rajasthan and 26.1% in urban parts of Rajasthan.<sup>7</sup> The study done by Godara et al in the Barmer district of Rajasthan reported HTN and pre-HTN prevalence as 22.0% and 50.7% respectively.<sup>7</sup> NPCDCS ("The national programme for the prevention and control of cancer, cardiovascular disease, diabetes, and stroke") primarily focus on HTN in individuals aged 30 or above.<sup>3</sup> As a result, it's important to analyse the HTN prevalence as well as the risk factors linked to it in this age category. HTN is also recognised as a "silent killer" because sometimes it can exist without causing any symptoms or signs.<sup>8</sup> According to the World Health Organization 46% of adults who have HTN are not aware of their condition.<sup>8</sup> As people suffering from hypertension may be unaware of their condition, it could be left undiagnosed and untreated for a longer duration, which can further lead to serious medical conditions. Thereby, it is essential for

adults aged 30 years or above to be screened for blood pressure. Also, hypertension is a very common disorder that is generally observed in OPD. Therefore, in this study, an attempt has been made to estimate the prevalence and factors associated with HTN. The study is conducted amongst individuals who were aged 30 years or plus, who attended the out-patients-department of the Gandhinagar urban PHC of Jaipur, Rajasthan India.

### ***Objectives***

This study's primary objective is to understand the prevalence of hypertension and pre-hypertension in people aged 30 years and above, visiting the outpatient department at the Gandhinagar urban primary health centre (Jaipur, Rajasthan, India). The secondary objective of the study is to identify the risk factors related to hypertension in the above-mentioned population

### **METHODS**

An out-patients-department (OPD) based, observational study was conducted among individuals who were aged 30 years or above and attended the Gandhinagar Urban PHC of Jaipur city in the state of Rajasthan. The study received ethical approval from the National Health Mission, Rajasthan. An informed consent was taken from every participant before starting to collect the data. The data was collected for one month from 10 January 2022 to 9 February 2022. The information was taken using a structured questionnaire that included specific questions about the gender, age, medical and family history of individuals and behavioural characteristics like alcohol and tobacco consumption, smokeless tobacco consumption, physical activity, and anthropometric measurements: height and weight. Blood Pressure was recorded, and body mass index was calculated.

### ***Inclusion criteria***

Inclusion criteria for current study were; individuals  $\geq 30$  years and individuals who visited the OPD of Gandhinagar UPHC within the timeframe of one month.

### ***Exclusion criteria***

Exclusion criteria for current study were; individuals < 30 years, individuals who refused to participate and cooperate and pregnant female patients.

### ***Measurements***

Height and weight: Standardized techniques and calibrated equipment were used to measure height and weight. A weighing-scale was utilized to record the weight to the nearest 0.5 kilograms. Before measuring height, the subject was asked to remove his/her shoes and socks. The height was then measured in a standing position.

**Blood-pressure:** The standardized BP measurement procedure was followed as per the guidelines of the MoHFW, Government of India.<sup>13,14</sup> The screening of hypertension was done by a physician or trained non-physician staff at the PHC. Before starting blood pressure measurements, participants were seated comfortably in calm and quiet surroundings for a minimum of 5 minutes. For measuring the blood pressure, an appropriate-sized cuff was placed at the level of the heart on the subject's arm. Then the cuff on the arm was inflated to 30 mm Hg and above the pressure at which the radial pulse is not heard anymore. The cuff was then deflated gradually at a pace of approximately 2-3 mm per second. The BP measured values were taken to the nearest 2 mmHg. Two readings were taken with at least 10 to 15 minutes of an interval between them. A third measurement was done if the two BP readings varied by more than 10 mm Hg, and the average was taken for all three readings. SBP and DBP were identified using the first and last audible Korotkoff sounds, respectively.<sup>13,14</sup> The pressure at which the sound was audible was recorded as SBP and the pressure at which the sound was no more audible was recorded as DBP.<sup>13,14</sup>

### **Data analysis and formulas**

**Blood pressure:** the national health mission (NPCDCS) criteria was used to diagnose hypertension and pre-hypertension.<sup>13,14</sup> According to NPCDCS; hypertension: systolic blood pressure  $\geq 140$  mmHg and or diastolic blood pressure  $\geq 90$  mmHg, hypertension: also if taking medicines for high blood-pressure. Pre-hypertension: systolic blood pressure  $\geq 120$  and  $\leq 139$  mmHg and or diastolic blood pressure  $\geq 80$  and  $\leq 89$  mmHg"

### **Calculation of prevalence**

$$\text{Hypertension prevalence} = \frac{\text{number of hypertensive subjects}}{\text{total number of subjects}} \times 100$$

$$\text{Prehypertension prevalence} = \frac{\text{numner of prehypertensive subjects}}{\text{total number of subjects}} \times 100.$$

### **Body mass index**

Body mass index (BMI) was calculated using the formula weight in kilograms divided by the square of the height in meters.<sup>14</sup>  $\text{BMI} = \text{weight}(\text{kg}) / \text{height}(\text{m}^2)$ . As per the National health mission (NPCDCS), obesity in Asian Indians is defined as  $\text{BMI} \geq 25 \text{ kg/m}^2$

### **Other factors**

When an individual had first and second-degree relatives (i.e., a parent, grandparent, or sibling) who had hypertension then they were considered to have a positive family history.

According to the National health mission, physical activity was divided into two criteria: physical activity

$\geq 150$  minutes per week or  $\leq 150$  minutes per week.<sup>15</sup> Tobacco is consumed in a variety of forms in India, individuals consuming cigarettes, bidi, and hookahs were classified as smokers.<sup>16</sup> Chewing betel quid, gutka or any other form of chewing tobacco were classified as smokeless tobacco consumers.<sup>16</sup> Also, it is difficult to measure the amount of tobacco consumed accurately so both former and current tobacco users were included in the study. Again, accurate measurement of the amount of alcohol consumed was not considered. Participants who accepted to consume alcohol more than four times a month were described as consumers of alcohol.<sup>16</sup> Alcohol consumption, Smoking, Smokeless tobacco consumption and family history of hypertension, all were divided into yes and no categories. An informed consent was also taken from every participant before starting to collect the data. The study's purpose and nature were clearly communicated to the participants. Confidentiality was assured to all the participants.

### **Statistical based analysis**

The data collection was done using "Microsoft-Excel". "SPSS (statistical package for social sciences)" for Windows was utilized for the tabulation and analysis of the data. Chi-square test was applied to statistically analyze if there is a significant association present between hypertension and its risk factors, The probability level of less than 0.05 ( $p < 0.05$ ) was considered statistically significant.

## **RESULTS**

### **Characteristics of the study population**

This study included 328 adults aged 30 years or more from Gandhinagar's urban primary health centre. Out of 328 individuals, 56.7% were males and 43.3% were females. Of the total population, 24.1% were in the age-group  $\geq 60$ , 29.9% were in the age-group 50-59 followed by 25.6% in the age-group 40-49 and 20.4% in the age-group 30-39. Among the total study population, 28.4% were obese ( $\text{BMI} \geq 25 \text{ kg/m}^2$ ). A total of 31.7% of individuals consumed alcohol, 34.1% of individuals smoked and 16.5% consumed smokeless tobacco. 68.6% of people did physical activity  $\leq 150$  minutes/week. A family history of hypertension was present in 31.4% individuals of the total study population (Table 1-8).

### **HTN and pre-HTN prevalence**

The prevalence of HTN in this study was estimated to be 23.2%. Prevalence was slightly higher in males (23.7%) compared to females (22.5%). The prevalence of Pre-HTN was estimated to be 33.2%. The prevalence of individuals with No-HTN was 43.6%. The prevalences are shown in (Figure 1).

### **Hypertension prevalence in variables**

The age-group with the highest HTN prevalence was 50-59 (28.6%) followed by 22.8% in individuals aged  $\geq 60$ , the prevalence of HTN was 22.6% in the age-group 40-49 and was lowest in the age-group 30-39 (16.4%) (Table 2). For the non-obese person, the prevalence of hypertension was 19.1% while in obese it was found to be 33.3% (Figure 2). For individuals doing physical activity  $\leq 150$  minutes per week, the prevalence of HTN was 25.8%. While for individuals doing physical activity  $\geq 150$  minutes per week the prevalence of HTN was 17.5% (Table 5, Figure 2). In Alcohol consumers the prevalence of HTN was 33.7% and in non-alcohol consumers, the prevalence was 18.3% (Table 6, Figure 2). In Smokers, the prevalence of HTN was found to be 33% while in nonsmokers the prevalence was 18.1% (Table 7, Figure 2). Individuals consuming smokeless tobacco had HTN prevalence of 20.4% and individuals not consuming smokeless tobacco had HTN prevalence of 23.7% (Table 8, Figure 2). For individuals with a positive family-history of hypertension, the HTN prevalence was 32% and individuals with no family-history of hypertension had HTN prevalence of 19.1% (Table 4, Figure 2).

**Table 1: Hypertension prevalence according to gender and hypertension association with gender.**

Gender	N (%)	HTN; N (%)	x <sup>2</sup>	P value
Male	186 56.7	44 23.7	0.057	0.812
Female	142 43.3	32 22.5		
Total	328 100.0	76 23.2		

**Table 2: Hypertension prevalence according to age group and hypertension association with age group.**

Age group (yrs)	N (%)	HTN; N (%)	x <sup>2</sup>	P value
30-39	67 20.4	11 16.4	3.343	0.342
40-49	84 25.6	19 22.6		
50-59	98 29.9	28 28.6		
$\geq 60$	79 24.1	18 22.8		
Total	328 100	76 23.2		

**Table 3: Hypertension prevalence according to BMI and hypertension association with BMI.**

BMI (kg/m <sup>2</sup> )	N (%)	HTN; N (%)	x <sup>2</sup>	P value
Obese ( $\geq 25$ )	93 28.4	31 33.3	7.531	0.006
Not obese ( $< 25$ )	235 71.6	45 19.1		
Total	328 100	76 23.2		

#### **Risk factors association with hypertension (HTN)**

The HTN prevalence according to gender, age group, BMI, family history and behavioural factors like physical activity, alcohol consumption, smoking and smokeless

tobacco consumption are given in (Table 1-8) respectively. The study findings reveal that gender, age, physical activity, and smokeless tobacco consumption was not significantly associated with HTN (Table 1, 2, 5, 8). Alcohol consumption with p value 0.002 (Table 6), smoking with p value 0.002 (Table 7), BMI with p value 0.006 (Table 3) and family history with p value 0.010 (Table 4) showed significant association with HTN.

**Table 4: Hypertension prevalence according to family-history and hypertension association with family-history.**

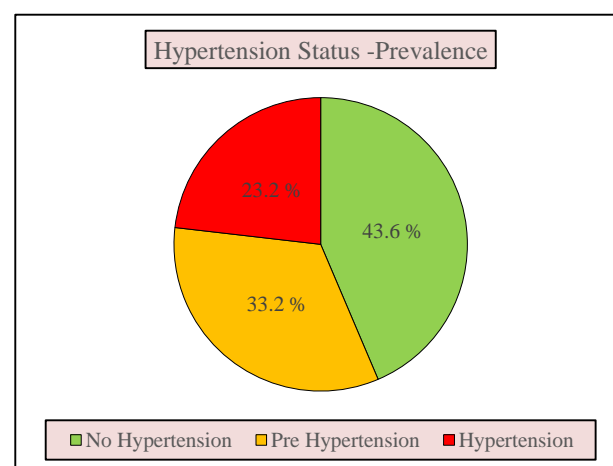
Family history of HTN	N (%)	HTN; N (%)	x <sup>2</sup>	P value
Present	103 31.4	33 32.0	6.633	0.010
Absent	225 68.6	43 19.1		
Total	328 100	76 23.2		

**Table 5: Hypertension prevalence according to physical activity and hypertension association with physical activity.**

Physical activity (mins/week)	N (%)	HTN; N (%)	x <sup>2</sup>	P value
$\leq 150$	225 68.6	58 25.8	2.736	0.098
$\geq 150$	103 31.4	18 17.5		
Total	328 100	76 23.2		

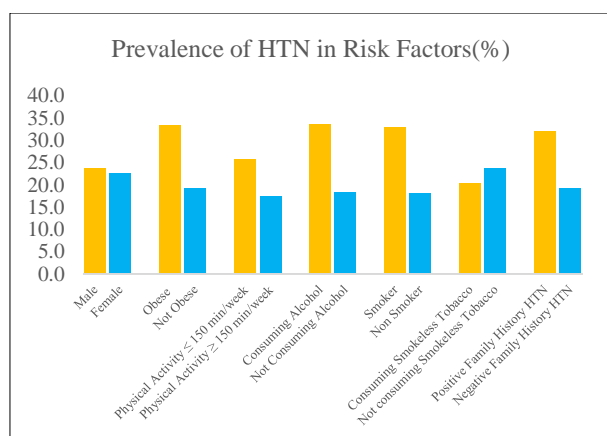
**Table 6: Hypertension prevalence according to alcohol consumption and hypertension association with alcohol consumption.**

Alcohol consumption	N (%)	HTN; N (%)	x <sup>2</sup>	P value
Yes	104 31.7	35 33.7	9.401	0.002
No	224 68.3	41 18.3		
Total	328 100	76 23.2		



**Figure 1: Prevalence of hypertension, pre-hypertension and no-hypertension.**





**Figure 2: Hypertension prevalence in risk factors.**

**Table 7: Hypertension prevalence according to smoking and hypertension association with smoking.**

Smoking	N (%)		HTN; N (%)		x <sup>2</sup>	P value
Yes	112	34.1	37	33.0		
No	216	65.9	39	18.1	9.297	0.002
Total	328	100.0	76	23.2		

**Table 8: Hypertension prevalence according to smokeless-tobacco consumption and hypertension association with smokeless-tobacco consumption.**

Smokeless tobacco consumption	N (%)		HTN; N (%)		x <sup>2</sup>	P value
Yes	54	16.5	11	20.4		
No	274	83.5	65	23.7	0.258	0.594
Total	328	100	76	23.2		

## DISCUSSION

According to the NCD risk factor collaboration, from the year 1990 to 2019, the number of individuals with hypertension doubled.<sup>17</sup> In 1990 there were 317 million males and 331 million females with hypertension but in the year 2020, the number of hypertensive males and females increased to 652 million and 626 million respectively.<sup>17</sup> HTN is a major risk factor for many serious medical conditions such as stroke, diabetes, cardiac disease, and renal disease.<sup>5</sup>

Hypertension directly contributes to morbidity and mortality.<sup>5</sup> As hypertension is a multi-factorial disease, thus research on its prevalence and related risk factors play a major part in its management. The HTN prevalence in our study was 23.2%. The result was closer to some studies like a study conducted in the Barmer district of Rajasthan stated that the prevalence was 22% for hypertension.<sup>7</sup> Another study with a similar result was a cross sectional comparative research done in the urban and rural areas of Jaipur district by Kumar et al in which the hypertension prevalence was reported to be 24.25% in

the urban area of Jaipur district.<sup>18</sup> A study by Geldsetzer et al reported the hypertension prevalence in the urban area of Rajasthan as 25.3%.<sup>7</sup> There are also other studies that show a higher prevalence of HTN like a study done by Galav et al in the year 2013 at Udaipur, Rajasthan reported the hypertension prevalence as 32.67%.<sup>19</sup> Anchala et al reported that the hypertension overall prevalence was 29.8% in India.<sup>10</sup> As the above-mentioned study considered Jaipur in west India the reported hypertension prevalence for urban western India was 35.8%.<sup>10</sup> The great India blood pressure survey done by Ramakrishnan et al found the overall hypertension prevalence to be 30.7%.<sup>9</sup> The findings of our study revealed that pre-hypertensive subjects contributed a significant proportion of the study participants, i.e. 32.3%. Even though pre-HTN is not considered in any category of disease, it is a reference used to identify individuals who are at higher risk of developing HTN. Therefore, pre-hypertensive people must be recommended to practise lifestyle changes to decrease their likelihood of developing hypertension in the coming years. The study reported a slightly higher hypertension prevalence in males, higher prevalence in obese, in individuals doing physical activity  $\leq 150$  min/week, consuming alcohol, smoking and positive HTN family history. But the higher prevalence of male gender, obesity and physical activity  $\leq 150$  min/week were not statistically significant. This study reports that obesity ( $\text{BMI} \geq 25 \text{ kg/m}^2$ ), alcohol consumption, smoking and family-history of HTN were significant risk determinants for HTN.

The study findings for obesity or high BMI were consistent with other studies like the research done by Gupta R et al observed that higher BMI was associated statistically with HTN in the urban residents of Jaipur.<sup>20</sup> Ghosh et al found that obesity/overweight was an important predictor of hypertension.<sup>21</sup> Hossain et al study analysed the association between HTN and higher BMI in the population of South Asia and reported a positive association of high BMI with hypertension in India, Bangladesh, and Nepal.<sup>22</sup> The present study reports that hypertension was significantly associated with smoking. Most of the studies reported similar findings. Like smoking was observed to be a significant determinant of HTN in the research by Gupta et al.<sup>20</sup>

A systematic review by Devi et al reported smoking as a common determinant for increasing the risk of hypertension.<sup>23</sup> However, consuming smokeless tobacco was not associated significantly with HTN in this study. Alcohol consumption was found to be statistically associated with HTN in this study. A similar result was present in research conducted by Kurjogi et al where consumption of alcohol was recognized as a risk factor for HTN.<sup>5</sup> On the other hand some studies reported alcohol consumption as not a significant factor like a study by Gupta et al.<sup>20</sup> Many studies also reported the association based on dose, frequency and pattern of alcohol and smoking consumption. In this study, this was

not considered and might have led to overreporting or underreporting/bias. Family history was also associated significantly with HTN in our study. Kumar et al conducted a study in the Jaipur district and found positive HTN family-history as a significant determinant of hypertension.<sup>18</sup> Chandrasekhar Rao et al also reported positive HTN family-history as a risk factor of significance for HTN.<sup>24</sup> People with a family-history of HTN may be considered as a risk population for developing hypertension and therefore timely identification of these individuals may benefit as timely targeted intervention can be provided. In many studies, the male gender showed significance with hypertension. Like in a study conducted in Barmer Rajasthan by Godara et al men had significantly higher hypertension prevalence.<sup>7</sup> Another study by Ghosh et al also revealed a higher hypertension prevalence among the male sex.<sup>21</sup> However, no such significant gender-wise trend is seen in this study. This study also did not find the significance of age with hypertension, but many studies have noted a higher HTN prevalence with increasing age. Gupta et al reported a statistically significant relation between hypertension with increasing age.<sup>20</sup> Study by Kumar et al reported statistical significance between increasing age and hypertension.<sup>25</sup> Physical activity  $\leq 150$  minutes/week did not show any significance. Some studies reported physical activity as significantly associated with hypertension like Gupta et al and Laxman et al.<sup>20,26</sup> As the data for this was purely based on self-reporting and may have led to over or under-reporting and this could have been the reason for physical activity not showing significance with hypertension.

### Limitations

The major limitation of this research was that a single-day blood pressure measurement was considered for estimating the hypertension prevalence in the people. Also, the participants of the study were selected from the outpatient department of the Gandhinagar urban primary health centre and thus they may not represent the entire population of Jaipur. As single-day measurements were considered there was no follow-up of the individuals involved in the study and this could have resulted in overestimation or underestimation of the HTN prevalence in the population. Another limitation is that the possibility of bias in self-reporting of lifestyle behaviour like smoking, alcohol consumption, and physical activity cannot be ruled out. The study also did not consider waist-hip ratio measurements, dietary factors like sodium intake, occupation, stress level and any other comorbidity which could be contributory factors in the development of hypertension.

### CONCLUSION

Overall, the results of this study show that the HTN and pre-HTN prevalence was significant in the study population of the Gandhinagar UPHC, Jaipur. This study

also reports that obesity, alcohol consumption, smoking and positive family history were significant risk factors for hypertension. Studying the disease prevalence and its relationship with lifestyle behaviours provides the information needed to develop intervention strategies. In the absence of lifestyle changes, individuals referred to as prehypertensive are at high risk of developing HTN in the coming years which could pose major challenges in the future. Early detection and timely intervention will reduce the effect of high BP thus decreasing the risk of developing CVDs, stroke, and renal impairment. Therefore, special care should be provided to individuals with pre-hypertension to avoid its further progression. NPCDCS should also consider addressing this problem of pre-hypertension in their future action plans.

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