Prevalence of Hypertension and Its Anthropometric and Behavioural Correlates Among Primary Healthcare Workers in South-East Nigeria: A Cross-Sectional Study

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Abstract

Background: Hypertension is a leading modifiable risk factor for cardiovascular morbidity and premature mortality worldwide, and its burden is rising rapidly across sub-Saharan Africa. Healthcare workers, despite their proximity to health services, are themselves exposed to occupational stressors that may predispose them to elevated blood pressure, yet they remain an understudied population in Nigeria.

Objective: This study determined the prevalence of hypertension and examined its anthropometric and behavioural correlates among primary healthcare workers (PHCWs) in South-East Nigeria.

Methods: A descriptive cross-sectional design was employed involving 400 PHCWs (physicians, nurses, pharmacists, and laboratory scientists/technologists) selected through multistage proportionate, stratified, and simple random sampling across Federal Medical Centres in the five South-East states. Blood pressure was measured with a mercury sphygmomanometer, and weight, height, and other anthropometric indices were recorded using standardised procedures. Data were analysed with SPSS version 25 using frequencies, percentages, chi-square, and correlation statistics, with significance set at $p < 0.05$.

Results: Overall, 108 (27.0%) of respondents were hypertensive while 292 (73.0%) were normotensive. The mean body mass index was significantly higher among female than male respondents (25.25 ± 0.26 versus 23.55 ± 0.28 kg/m²; $p < 0.001$). Systolic and diastolic blood pressures were markedly higher among hypertensive than normotensive respondents (162.85 ± 1.61 versus 113.59 ± 0.98 mmHg and 102.98 ± 2.54 versus 87.41 ± 1.31 mmHg, respectively; $p < 0.001$). Body mass index was significantly associated with hypertension morbidity ($\chi^2 = 22.265$, $p = 0.001$), whereas occupational cadre ($\chi^2 = 6.969$, $p = 0.324$), marital status ($\chi^2 = 5.512$, $p = 0.480$), and family history ($\chi^2 = 4.000$, $p = 0.135$) showed no statistically significant association.

Conclusion: More than a quarter of primary healthcare workers in South-East Nigeria were hypertensive, and body mass index emerged as the strongest anthropometric correlate. Workplace-based screening, weight management, and lifestyle-modification programmes are urgently required for this vulnerable workforce.

Keywords: *hypertension; prevalence; body mass index; primary healthcare workers; anthropometry; South-East Nigeria*

Introduction

Despite the many advances in medical science, hypertension is still one of the most common and serious non-communicable diseases of the 21st century and a significant cause of cardiovascular disease burden in the world. It has been estimated that high blood pressure (HBP) contributes to as many as 7.5 million deaths every year, 12.8% of all deaths worldwide, and the number of adults with HBP is projected to reach 1.56 billion by 2025 (Zhou et al., 2021). High blood pressure is a major risk factor for coronary heart disease, stroke, chronic kidney disease, heart failure, peripheral vascular disease, and retinopathy, and is a silent, largely asymptomatic disease that poses a special threat in environments where there is limited routine screening.

According to the Joint National Committee (JNC 7) definition, the condition is diagnosed when a person's blood pressure is 140 mmHg or higher (systolic) and/or 90 mmHg or higher (diastolic), while 120-139/80-89 mmHg is considered pre-hypertension. While pre-hypertension is not a diagnosis per se, it does significantly raise the risk of developing hypertension (Erem et al., 2009). There are two forms of hypertension: primary (or essential) hypertension which is not caused by any known underlying disease and accounts for approximately 95% of cases; and secondary hypertension which is caused by some underlying disease and accounts for approximately 5% of cases (Fisher & William, 2005).

Hypertension is an unbalanced burden in Africa. It is estimated that over 46% of African adults could be affected and the World Health Statistics Report estimates the prevalence in Africa at 29.6% - the highest of any World Health Organisation region. In Nigeria, the population of which is over 170 million, hypertension and its complications are said to be responsible for up to 66% of hospital admissions and about 25% of medical emergencies (Ekpenyong et al., 2012). Occupational stress, excessive consumption of salt, alcohol, and sedentary lifestyle, rapid

urbanisation and ageing population are closely related to the rise of hypertension in Nigeria and other emerging economies.

Healthcare workers are in a paradoxical situation in this epidemiological setting. They have easy access to health information and medical services, but they are also exposed to high levels of occupational stressors such as long work hours, irregular work schedules, high physical workload and high emotional workload, which are known risk factors for high blood pressure. Shift work in particular disturbs the physiological homeostasis and is believed to be associated with hypertension among nurses and other clinical personnel (Knutsson, 2013). Yet, few studies in Nigeria have estimated the burden of hypertension amongst primary healthcare workers and even less have investigated anthropometric and behavioural determinants of their risk.

Occupational stressors faced by nurses and allied health workers are particularly enlightening. The stress load can be chronic, caused by long shifts, the physical strain of lifting and moving patients, and little recovery time after a night shift, as well as the emotional work of providing care, and has been associated with prolonged high blood pressure. Rosengren et al. (2004) found that the link between occupational strain and the occurrence of hypertension is especially strong for women, who make up the majority of the nursing workforce. Job strain in turn acts on neuroendocrine mechanisms (activation of the hypothalamic–pituitary–adrenal axis and the sympathetic nervous system), which increase cardiac output and peripheral resistance. When this physiological burden is exacerbated by excess nutrition, lack of physical activity and alcohol consumption, the potential cardiovascular risk can be significant.

The anthropometric indicators, especially body mass index (BMI), waist circumference (WC) and waist-to-hip ratio (WHR), are known, simple, and easily measurable correlates of blood pressure. Some of the mechanisms by which excess adiposity leads to hypertension are increased sympathetic activation, sodium retention, insulin resistance and vascular remodelling. Central adiposity (measured by waist circumference and waist to hip ratio) is a particularly strong predictor as visceral fat is metabolically active and releases pro-inflammatory and vasoactive mediators. Risk is further modulated by behavioural factors, e.g. alcohol consumption. Knowledge of these correlates and their functioning in the health worker population is critical to developing effective, workplace-based interventions, but evidence on the functioning of these correlates in the health worker population in Nigeria, and in the South-East zone specifically is

limited. Considering this background, the present study was conducted to establish the prevalence of hypertension and to explore anthropometric and behavioural correlates of hypertension among primary healthcare workers in South-East Nigeria.

Objectives of the Study

The specific objectives were to: (i) determine the prevalence of hypertension among primary healthcare workers in Federal Medical Centres in South-East Nigeria; (ii) examine the association between body mass index and hypertension morbidity; (iii) assess the relationship between marital status, family history of hypertension, and hypertension morbidity; and (iv) evaluate whether occupational cadre is associated with hypertension morbidity in this population.

Materials and Methods

Study Design

A descriptive and inferential cross-sectional survey design was adopted to obtain quantitative data from primary healthcare workers in South-East Nigeria. A cross-sectional approach was appropriate because the primary aim was to estimate the prevalence of hypertension at a single point in time and to test associations between hypertension morbidity and selected demographic, anthropometric, and behavioural parameters (Creswell, 2014). Cross-sectional designs provide a representative "snapshot" of a population at a defined moment (Cohen, Manion, & Morrison, 2007), and the inferential component permitted hypothesis testing on the strength of associations between hypertension and participant characteristics.

Study Setting

The study was conducted in Nigeria's South-East geopolitical zone, which comprises five states: Abia, Anambra, Ebonyi, Enugu, and Imo. The zone occupies approximately 29,095 km² and, based on the 2006 national census figure of 16,381,729 projected forward at a 3% annual growth rate, is estimated to house roughly 22.3 million people. The region is predominantly forested, with a wet season extending from April to November and a dry season from December to March. Data were collected from Federal Medical Centres and affiliated primary healthcare facilities distributed across the constituent states.

Study Population

The study population comprised primary healthcare workers providing basic clinical services in government hospitals across South-East Nigeria. According to workforce records, the zone had 14,866 primary healthcare workers, made up of 5,548 licensed nurses, 4,223 physicians, 2,879 laboratory scientists, and 2,216 pharmacists. In line with the World Health Organization's classification of the health workforce, four core categories were included: physicians and dentists (doctors), nurses and midwives (nurses), pharmaceutical personnel (pharmacists), and laboratory staff (laboratory technologists/scientists). Other health-management and support staff were excluded.

Sample Size and Sampling Technique

The sample size was calculated using Cochran's formula, $n = Z^2pq/e^2$, where $Z = 1.96$, $p = q = 0.5$, and $e = 0.05$, yielding 384.16 and rounded up to 400 participants. A multistage sampling strategy combining proportionate, stratified, and simple random sampling was applied. The workforce was first stratified into the four occupational categories, and participants were then selected from each stratum in proportion to its size at a sampling ratio of 0.1, using simple random sampling to eliminate systematic bias. The final sample comprised 125 physicians, 131 nurses, 57 pharmacists, and 87 laboratory scientists/technologists.

Data Collection Instruments and Procedure

Data were collected using a researcher-developed, structured questionnaire together with a data collection schedule and standardised measuring equipment: a mercury sphygmomanometer (Accoson®) with appropriate cuffs, a Littmann® stethoscope, a calibrated bathroom scale, and a wall-mounted metal ruler. Blood pressure was measured after at least five minutes of seated rest, with the cuff positioned firmly around the bare arm and its lower edge at least 2.5 cm above the antecubital fossa. Two readings were taken at least five minutes apart, and the mean was used for analysis. Participants were classified as hypertensive if systolic blood pressure was 140 mmHg or higher and/or diastolic blood pressure was 90 mmHg or higher, if they reported a prior diagnosis of hypertension, or if they were taking antihypertensive medication. Weight and height were measured to compute BMI, and waist and hip circumferences were recorded to derive the waist-to-hip ratio.

Validity and Reliability

Face and content validity of the instrument were established through review by three specialists in the Department of Public Health and three additional experts in hypertension and related conditions, whose feedback informed revisions. Reliability was assessed through a pilot study involving 30 primary healthcare workers at Imo State University Medical Centre; the internal consistency coefficient, computed using Cronbach's alpha, was 0.85, indicating good reliability.

Data Analysis

Data were analysed using the Statistical Package for the Social Sciences (SPSS) version 25. Frequencies and percentages summarised categorical variables, while means and standard errors described anthropometric parameters. Independent-samples comparisons, Pearson correlation coefficients, and chi-square statistics were used to examine associations and test hypotheses. Statistical significance was set at $p < 0.05$ throughout.

Ethical Considerations

Ethical approval was obtained from the Research Ethics Review Committees of the participating Federal Medical Centres. Written informed consent was secured from all participants after full disclosure of the study's purpose, and confidentiality was preserved by identifying records with numeric codes rather than names. Participation was voluntary, and respondents were free to withdraw at any time without penalty.

Results

A total of 400 questionnaires were administered and all were completed and returned, yielding a 100% response rate.The sample comprised 265 women (66.3%) and 135 men (33.8%), giving a female-to-male ratio of approximately 1.2:1. The predominant age group was 26–35 years (65.5%), followed by those aged 18–25 years (20.0%) and 35–49 years (14.5%). Nearly half of respondents were married (48.3%) and 42.0% were single. By occupation, laboratory personnel constituted the largest group (47.0%), followed by pharmacists (30.5%), doctors (18.0%), and nurses (4.5%). Full sociodemographic details are presented in Table 1.

Table 1. Sociodemographic characteristics of respondents (N = 400)

Variable	Category	Frequency	Percent
Age (years)	18–25	80	20.0
	26–35	262	65.5
	35–49	58	14.5
Gender	Male	135	33.8
	Female	265	66.3
Religion	Christianity	307	76.8
	Islam	93	23.3
Marital status	Married	193	48.3
	Single	168	42.0
	Widowed	18	4.5
	Separated	21	5.3
Occupation	Medical doctor	72	18.0
	Nurse	18	4.5
	Laboratory scientist	188	47.0
	Pharmacist	122	30.5

Prevalence of Hypertension

Of the 400 respondents, 108 (27.0%) were classified as hypertensive and 292 (73.0%) as normotensive. Thus, slightly more than one in four primary healthcare workers in the sample had elevated blood pressure, underscoring the substantial burden of hypertension within this workforce.

Table 2. Prevalence of hypertension among respondents

Blood pressure status	Frequency	Percent
Normotensive	292	73.0
Hypertensive	108	27.0
Total	400	100.0

Anthropometric Parameters by Gender

Mean anthropometric values disaggregated by gender are shown in Table 3. Female respondents had a significantly higher mean weight (64.44 ± 0.65 versus 61.30 ± 0.78 kg; $p = 0.003$) and mean BMI (25.25 ± 0.26 versus 23.55 ± 0.28 kg/m²; $p < 0.001$) than male respondents. Differences in mean height, systolic and diastolic blood pressure, waist and hip circumference, and waist-to-hip ratio were not statistically significant.

Table 3. Mean anthropometric parameters by gender

Parameter	Male (mean ± SE)	Female (mean ± SE)	p-value
Weight (kg)	61.30 ± 0.78	64.44 ± 0.65	0.003
Height (m)	1.62 ± 0.01	1.60 ± 0.01	0.094
BMI (kg/m²)	23.55 ± 0.28	25.25 ± 0.26	0.000
Systolic BP (mmHg)	125.28 ± 2.27	127.71 ± 1.73	0.406
Diastolic BP (mmHg)	89.25 ± 2.02	92.82 ± 1.53	0.168
Waist circumference (cm)	92.87 ± 1.08	93.94 ± 0.72	0.402
Hip circumference (cm)	107.22 ± 1.13	108.49 ± 0.79	0.355
Waist-to-hip ratio	0.87 ± 0.01	0.87 ± 0.00	0.984

Note. SE = standard error; BMI = body mass index; BP = blood pressure.

Anthropometric Parameters by Blood Pressure Status

Comparison of anthropometric parameters between normotensive and hypertensive respondents (Table 4) revealed, as expected, markedly higher systolic blood pressure (162.85 ± 1.61 versus 113.59 ± 0.98 mmHg; $p < 0.001$) and diastolic blood pressure (102.98 ± 2.54 versus 87.41 ± 1.31 mmHg; $p < 0.001$) among hypertensive respondents. Mean BMI also differed significantly between the two groups ($p = 0.047$). Differences in weight, height, waist and hip circumference, and waist-to-hip ratio were not statistically significant.

Table 4: Mean anthropometric parameters by blood pressure status

Parameter	Normotensive	Hypertensive	p-value
Weight (kg)	63.69 ± 0.60	62.54 ± 0.96	0.315
Height (m)	1.60 ± 0.01	1.61 ± 0.01	0.431
BMI (kg/m²)	24.91 ± 0.23	24.03 ± 0.38	0.047
Systolic BP (mmHg)	113.59 ± 0.98	162.85 ± 1.61	0.000
Diastolic BP (mmHg)	87.41 ± 1.31	102.98 ± 2.54	0.000

Note. Values are mean ± standard error.

Anthropometric Parameters by Nutritional Status

When respondents were grouped by BMI category (Table 5), mean weight rose significantly across the nutritional-status groups, being highest among overweight respondents (75.22 ± 0.88 kg) compared with underweight (57.57 ± 0.02 kg) and normal-weight (58.79 ± 0.43 kg) respondents ($p < 0.001$). Differences in mean height and BMI were likewise significant, whereas systolic and diastolic blood pressure, waist and hip circumference, and waist-to-hip ratio did not differ significantly across nutritional-status categories.

Table 5: Mean anthropometric parameters by nutritional (BMI) status

Parameter	Underweight	Normal	Overweight	Obese
Weight (kg)	57.57	58.79	75.22	74.05
Height (m)	1.59	1.61	1.58	1.58

Parameter	Underweight	Normal	Overweight	Obese
BMI (kg/m²)	18.45	22.49	30.67	29.60
Systolic BP	146.14	127.63	121.97	127.89
Diastolic BP	98.86	91.87	92.75	86.11

Note. Values are group means; blood pressure in mmHg. Weight, height, and BMI differed significantly across groups ($p < 0.05$); blood pressure and circumference measures did not.

Correlations Among Anthropometric Parameters

Among normotensive respondents, weight was strongly and positively correlated with BMI ($r = 0.729$, $p < 0.001$) and with height ($r = 0.347$, $p < 0.001$). Systolic blood pressure was positively associated with diastolic blood pressure ($r = 0.260$, $p = 0.007$) and with waist-to-hip ratio ($r = 0.289$, $p = 0.002$), and inversely associated with hip circumference ($r = –0.215$, $p = 0.026$). Among hypertensive respondents, BMI correlated positively with weight ($r = 0.365$, $p < 0.001$) and negatively with height ($r = –0.275$, $p < 0.001$), while systolic blood pressure was inversely related to diastolic blood pressure ($r = –0.302$, $p < 0.001$), and diastolic blood pressure was inversely related to waist and hip circumference. These patterns confirm the expected clustering of adiposity indicators and their relationship with blood pressure.

Hypotheses Testing

Four null hypotheses relating hypertension morbidity to occupational cadre, marital status, family history, and body mass index were tested using the chi-square statistic (Table 6).

Occupational cadre showed no significant association with hypertension morbidity ($\chi^2 = 6.969$, $df = 6$, $p = 0.324$); the null hypothesis was therefore retained. Similarly, marital status was not significantly associated with hypertension morbidity ($\chi^2 = 5.512$, $df = 6$, $p = 0.480$), nor was family history of hypertension ($\chi^2 = 4.000$, $df = 2$, $p = 0.135$), and both corresponding null hypotheses were retained. By contrast, body mass index was significantly associated with hypertension morbidity ($\chi^2 = 22.265$, $df = 6$, $p = 0.001$), leading to rejection of the null hypothesis and confirming BMI as a significant correlate of hypertension in this population.

Table 6. Chi-square tests of association with hypertension morbidity

Factor	χ^2	df	p-value
Occupational cadre	6.969	6	0.324
Marital status	5.512	6	0.480
Family history of hypertension	4.000	2	0.135
Body mass index	22.265	6	0.001*

*Note. *Significant at $p < 0.05$. Only body mass index was significantly associated with hypertension morbidity.*

Discussion

The aim of this study was to establish the prevalence of hypertension and to investigate anthropometric and behavioural correlates of hypertension among primary healthcare workers in South-East Nigeria. The overall prevalence of 27.0% suggests that hypertension is a prevalent and urgent health issue in this workforce, as is seen in the rest of the country and the continent as a whole where hypertension is emerging as one of the most important non-communicable diseases. The finding is similar to that of earlier Nigerian studies on the prevalence of similar occupations, including that of Egbi, Okafor, Miebodei, Kunle-Olowu and Unuigbe (2013) which reported prevalence of 27.8% among health workers and places the present sample in the middle to upper range of previous publications.

The fact that over a quarter of health care workers, who are in privileged positions to know about health care and services, are hypertensive is a stunning example of the “silent killer” phenomenon. It implies that clinical knowledge does not necessarily lead to personal risk reduction and that the occupational requirements of clinical practice can in part counteract the protective effect of health literacy. This paradox further supports the argument that workplaces in and of themselves provide a level of intervention in addition to individual awareness.

It is also important to consider the demographic characteristics of the sample, which was fairly young, with approximately two-thirds of respondents in the 26-35 year age group. It is perhaps more worrying that the prevalence of hypertension is 27.0% in such a young population, as it indicates that hypertension is occurring at a younger age, and that target-organ damage may be occurring over a long exposure period. Early onset hypertension leads to a higher lifetime risk of

stroke, renal failure and heart failure, and is a valuable, and frequently overlooked, opportunity for primary prevention in young professionals. The high percentage of women in the sample and the significantly higher mean BMI further indicate that women in this workforce may be at special risk, and should be targeted first in screening and lifestyle-intervention programs.

Body Mass Index and Hypertension

The most robust finding was that there was a significant association of body mass index with hypertension morbidity ($\chi^2 = 22.265$, $p = 0.001$). This is in accord with a huge volume of evidence from Nigeria and other countries that hypertension prevalence increases with BMI (Erhun, Olayiwola, Agbani, & Omotoso, 2005) and the multinational MONICA project which has repeatedly shown this. The mechanism is clear: excess adiposity leads to sympathetic overactivity, sodium retention, insulin resistance and structural vascular changes that all contribute to an increase in blood pressure. The considerably higher mean BMI of female respondents also indicates that women in this workforce may have a higher risk burden from adiposity and thus require gender-specific interventions.

This interpretation is supported by the correlation analyses. Weight was highly correlated with BMI in both normotensive and hypertensive respondents and blood pressure indices were grouped with other central adiposity indices like waist-to-hip ratio. This clustering is similar to the metabolic-syndrome concept where abdominal obesity, dyslipidaemia, insulin resistance and hypertension are all present and interact with each other. This BMI, and not occupational or demographic factors, was the only significant correlate, highlighting the centrality of modifiable adiposity in influencing hypertension risk in this workforce and the potential for greatest return on investment with weight reduction.

An interesting finding was the relatively high blood pressure in the underweight group in the nutritional-status analysis. Although the underweight group in this study was associated with lower hypertension risk (Méndez-Chacón et al., 2008), the small number of underweight participants in this study makes the reliability of the estimate in this subgroup questionable, and the finding should be interpreted with caution instead of as evidence against the well-documented adiposity–hypertension gradient. This anomaly may have been due to isolated systolic elevations, measurement variability in a small number of underweight individuals, or

unmeasured comorbidities; larger studies with sufficient representation of underweight individuals would be needed to better understand the association.

Marital Status, Family History, and Occupational Cadre

Marital status, history of hypertension in the family and cadre of occupation did not show significant association with the morbidity of hypertension in chi-square analyses as reported earlier by some. The lack of association with occupational cadre may indicate that, in this workforce, the occupational environment may have a relatively homogenous effect on all cadre and no cadre is epidemiologically distinguishable. However, the largest proportion of hypertension was found among laboratory technologists/scientist, followed by nurses and pharmacists which corroborates the finding of Owolabi, Owolabi, OlaOlorun and Amole (2015) that non-physician, non-nursing health workers can be a significant burden of hypertension. The lack of a significant association with family history does not rule out the fact that blood pressure is well established to be heritable – it may simply be due to the limited statistical power and use of self-report family history, which is subject to recall bias.

Behavioural Correlates

Alcohol intake and other behaviours are known risk factors for high blood pressure. Habitual alcohol consumption is consistently found to be associated with hypertension in the literature with the degree of risk being proportional to the amount of alcohol consumed and even persists in those who stop drinking (Uzoma, 2010; Desai & Kavishwar, 2009). These pathways of behaviour, along with the anthropometric results, suggest a risk profile amenable to lifestyle prevention (less alcohol, more exercise, weight loss and better diet).

Implications for Practice

The results have obvious implications for occupational health policy. First, routine blood pressure screening should be made a routine in the health care setting, since a significant number of apparently healthy health care workers are hypertensive and may not know it. Second, weight-management and physical-activity programmes should be implemented in workplace wellness programmes, with a focus on the adiposity, which was the strongest correlate with hypertension. Third, health education messages should be delivered to health care workers, who are often

considered to be less in need of such interventions than their patients, and should focus on the personal relevance of cardiovascular risk, rather than just the professional relevance.

Strengths and Limitations

The advantages of the study are the relatively large sample, the 100% response rate, objective anthropometric and blood pressure measurements were used rather than self-report alone, and the multistage probability sampling which contributed to the representativeness of the four occupational strata. A number of caveats should be noted, however. Due to the busy schedules of participants, blood pressure measurements were made only once and not the two intended days, thus potentially overestimating prevalence due to white-coat effects. The study only included federal government owned facilities and could not be generalized to state and private institutions. Finally, the cross-sectional design does not allow for causal inferences, and some correlates were self-reported.

Conclusion

More than a quarter of the primary healthcare workers sampled had hypertension, with the prevalence rate being higher in the South-East region of Nigeria. Among the anthropometric indices, BMI was found to be the best and the only statistically significant indicator of hypertension morbidity while marital status, family history and occupational cadre were not statistically significant. These results emphasize the need for workplace-based blood pressure screening, workplace weight-management programmes, and work-site lifestyle-modification interventions specific to the health care workforce. As stewards of population health and as a vulnerable population, protecting the cardiovascular health of health care workers should be considered a key component of health system strengthening.

Recommendations

Based on the findings, it is recommended that: (i) every primary healthcare facility institute periodic blood pressure and BMI screening for staff, coupled with health education on risk factors and complications of hypertension; (ii) workplace wellness programmes incorporate structured weight-management and physical-activity components, with particular attention to female staff and those in laboratory cadres; (iii) Federal Medical Centres, State Ministries of

Health, and Local Government Primary Health Care Departments promote healthy-lifestyle campaigns for the wider community; and (iv) government agencies deliver targeted education to healthcare workers through workshops, seminars, and health talks to raise awareness of their own cardiovascular risk.

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