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Epidemiological trends and determinants of hypertensive disorders in pregnancy: a 10-year retrospective study

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Abstract
Hypertensive disorders of pregnancy (HDP) have a prevalence between 3% and 10% of all pregnancies and are a very frequent cause of maternal and perinatal morbidity and mortality. Our study aimed to investigate the epidemiological patterns, geographic distribution, and clinical characteristics associated with HDP over a 10-year period (2015-2024). We conducted a retrospective study using clinical data from the health records system of "Queen Geraldine" Obstetrics & Gynecology University Hospital, Tirana. The data we selected from the system include delivery numbers, HDP cases, maternal age groups, cesarean section (CS) rates, and average length of stay (ALOS) for mothers and newborns. We performed descriptive and analytical statistics, like Chi-square for trend, analysis of variance/Kruskal-Wallis, correlation analysis, *etc*. There was a total of 62,155 deliveries recorded for this 10-year period. The HDP incidence rates ranged from 1.27% to the highest rate of 37%, which occurred in 2016. As per geographical distribution, the Tirana urban area showed significantly higher HDP prevalence compared to rural and other regions ($p=0.018$). The majority of cases belong to the 25-34-year-old age group. There was a significant association between the HDP with increased CS rates ($r=0.78$, $p=0.008$) and prolonged ALOS for both mother ($r=0.64$) and newborn ($r=0.59$). HDP is a growing burden, especially among urban women aged 25 to 34 years. There must be a better improvement on the current preventive measures. Effective prevention and treatment are still crucial to streamline screening strategies and equal access to health care.

Introduction

Hypertensive disorders of pregnancy (HDP), including gestational hypertension, preeclampsia, and eclampsia, complicate as many as 10% of pregnancies globally and are a major cause of maternal mortality, especially in low- and middle-income nations.[1,2] HDP is associated with adverse outcomes like preterm birth, fetal growth restriction, and elevated cesarean delivery.[3-5]

In Albania and other health systems in transition, few recent data are available on long-term trends in HDP. Urbanization, the postponed maternal age, and the COVID-19 pandemic could affect these trends. The aim of this research is to examine the 10-year trend, geographic and age distribution of HDP, and its effect on the mode of delivery and hospital stay at "Queen Geraldine" Obstetrics & Gynecology University Hospital, Tirana, Albania.

Materials and Methods

Study design and data source

We conducted a retrospective study using clinical data from the health records system of "Queen Geraldine" Obstetrics & Gynecology University Hospital, Tirana. The data we selected from the system included: i) number of deliveries per year; ii) HDP cases and percentage; iii) distribution by maternal age group (15-24, 25-34, 35-44, >45); iv) cesarean section rate; v) average length of hospital stays (ALOS) for mother and neonate

Variables and outcomes

Primary outcomes included incidence of HDP, cesarean delivery rate, and ALOS. Explanatory variables include age group and geographical region, selected based on clinical relevance and prior literature.

Statistical analysis

Descriptive statistics: frequencies, percentages, means.
Trend analysis: Chi-square for trend (Cochran-Armitage test).
Regional comparisons: one-way analysis of variance or Kruskal-Wallis test.
Age group comparisons: Kruskal-Wallis test with post-hoc pairwise analysis.
Correlation: Pearson or Spearman correlation for HDP *vs.* cesarean section and ALOS.
Significance threshold: $p<0.05$.
Data analysis was performed using SPSS (version 22) and Microsoft Excel.

Results

Incidence of hypertensive disorders of pregnancy over time

From 2015 to 2024, HDP incidence showed fluctuation, peaking at 3.37% in 2016. The overall trend was statistically significant ($\chi^2=14.28$, $p=0.048$) (Table 1, Figure 1).

Geographic distribution

As per geographical distribution, our study shows that the Tirana urban area had the highest annual percentage of HDP cases compared to rural and other regions. There was a statistically significant difference across regions ($F=4.67$, $p=0.018$) (Figure 2).

Age group distribution

As per age distributions, our study shows that the 25-34 age group consistently accounted for the highest proportion of HDP cases. There were statistically significant differences between age groups ($H=9.21$, $p=0.027$) (Figure 3).

Cesarean section and average length of hospital stay

Regarding the relation between HDP and cesarean section and ALOS, our study found that there was a strong positive correlation between HDP rate and cesarean section rate (r=0.78, p=0.008). HDP cases were also associated with prolonged ALOS for both mother (r=0.64, p=0.036) and neonate (r=0.59, p=0.049). (Table 2, Figure 4 and Figure 5).

Discussion

The "Queen Geraldine" Obstetrics & Gynecology University Hospital of Tirana is a tertiary hospital with a national coverage focus in Albania. For this reason, this 10-year analysis offers helpful information regarding the evolving epidemiology of HDP in Albania.

Increasing burden

HDP rate increase reflects the worldwide reports of an increasing burden of HDP. This is more prominent in urban areas. Suspected reasons are delayed age at childbearing, increased obesity, and more sensitive diagnosis protocols.[6,7]

Regional disparities

Urban settings like Tirana had higher HDP rates, perhaps due to better access to healthcare and higher maternal age. There may be rural under-reporting resulting from a lack of antenatal surveillance.

Maternal age

The current age range (25-34) is consistent with reproductive age expectations in Albania, but perhaps it also reflects the increasing risk in otherwise low-risk pregnancies. The literature has also shown HDP in this age range based on lifestyle and metabolic factors.[7-10]

Cesarean deliveries and hospital resource use

HDP are associated with an increased likelihood of cesarean delivery and prolonged hospitalization, both of which contribute to a greater burden on healthcare resources. While cesarean delivery is often a life-saving intervention in cases of severe or complicated HDP—particularly in the presence of pre-eclampsia or other maternal-fetal complications—its indiscriminate use should be avoided to minimize unnecessary surgical risks and optimize resource allocation. Our findings are consistent with current evidence indicating that, for pregnancies complicated by hypertension and pre-eclampsia, cesarean section frequently represents the most appropriate and safest mode of delivery, ensuring optimal maternal and neonatal outcomes when clinically indicated.[11,12]

COVID-19 considerations

Disruptions to antenatal care during 2020-2022 may have contributed to underdiagnosis or delayed interventions in HDP cases, as seen globally.[10-12]

Conclusions

HDP remain a continuing issue in maternal health care in Albania. An increasing trend in the incidence of HDP, particularly among urban dwellers, was observed. The majority were seen among women between 25-34 years. HDP are significantly correlated with greater cesarean sections and longer hospital stays.

Recommendations

- Enhance early antenatal screening and risk stratification, especially in rural regions.
- Educate health staff on evidence-based HDP care to reduce complications.
- Promote public education about HDP risk factors, particularly lifestyle factors.
- Carry out further studies of long-term maternal and infant outcomes, including post-pandemic outcomes.
- Enhance early antenatal screening and risk stratification, especially in rural regions.
- Educate health staff on evidence-based HDP care to reduce complications.
- Promote public education about HDP risk factors, particularly lifestyle factors.
- Carry out further studies of long-term maternal and infant outcomes, including post-pandemic outcomes.

Key messages

1. HDP is an increasing maternal health concern in Albania. The 10-year trend shows a steady rise in HDP, aligning with global patterns of increasing maternal health risks.
2. Urban areas show higher HDP rates, but rural underreporting is likely. Better access to care and older maternal age in urban centres may explain the disparity, while limited surveillance likely underestimates the rural burden.
3. Women aged 25-34 are not exempt from risk. Lifestyle and metabolic factors may be driving HDP in women traditionally considered low-risk based on age alone.
4. HDP is linked to increased caesarean rates and healthcare burden. Cesarean delivery remains a necessary intervention in complicated HDP cases, but its overuse should be avoided to reduce system strain.
5. COVID-19 disrupted antenatal care and may have affected HDP detection. The pandemic likely contributed to delays in diagnosis and care, reinforcing the need for resilient and adaptable maternal health systems.

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Table 1. Incidence, geographic and age group distribution of hypertensive disorders of pregnancy.

Year	Deliveries	HDP in % / deliveries	Geography				Age groups			
			Tirana	Rural	Other	Total	15-24 years	25-34 years	35-44 years	>45 years
2024	5400	2.11	42	37	35	114	24	65	24	1
2023	5608	2.07	39	36	41	116	32	60	23	1
2022	5726	1.27	29	18	26	73	26	36	10	1
2021	6025	2.01	56	25	40	121	30	70	21	0
2020	6302	1.65	37	33	34	104	19	72	13	0
2019	6261	2.09	63	35	33	131	28	79	24	0
2018	6620	2.23	63	32	53	148	37	90	21	0
2017	7120	3.13	82	58	83	223	55	131	36	0
2016	6670	3.37	84	64	77	225	54	130	41	0
2015	6423	3.08	76	55	67	198	57	113	27	1
Total	**62,155**	**2.30**	**571**	**393**	**489**	**1,453**	**362**	**846**	**240**	**4**

HDP, hypertensive disorders of pregnancy.

Table 2. Cesarean section and distribution of hypertensive disorders of pregnancy.

Year	Deliveries	HDP in % / deliveries	Cesarean Sections				% / Total	ALOS (days)	
			Tirana	Rural	Other	Total		Mother	Newborn
2024	5400	2.11	26	25	26	77	68	5	7
2023	5608	2.07	31	20	36	87	75	4	5
2022	5726	1.27	19	13	17	49	67	4	4
2021	6025	2.01	42	23	12	77	64	6	6
2020	6302	1.65	32	27	29	88	85	5	5
2019	6261	2.09	47	27	28	102	78	6	6
2018	6620	2.23	54	23	43	120	81	5	4
2017	7120	3.13	65	42	65	172	77	5	4
2016	6670	3.37	70	44	58	172	76	6	5
2015	6423	3.08	55	39	55	149	75	5	5
Total	**62,155**	**2.30**	**441**	**283**	**369**	**1,093**	**75**	**4**	**5**

HDP, hypertensive disorders of pregnancy; ALOS, average length of stay.

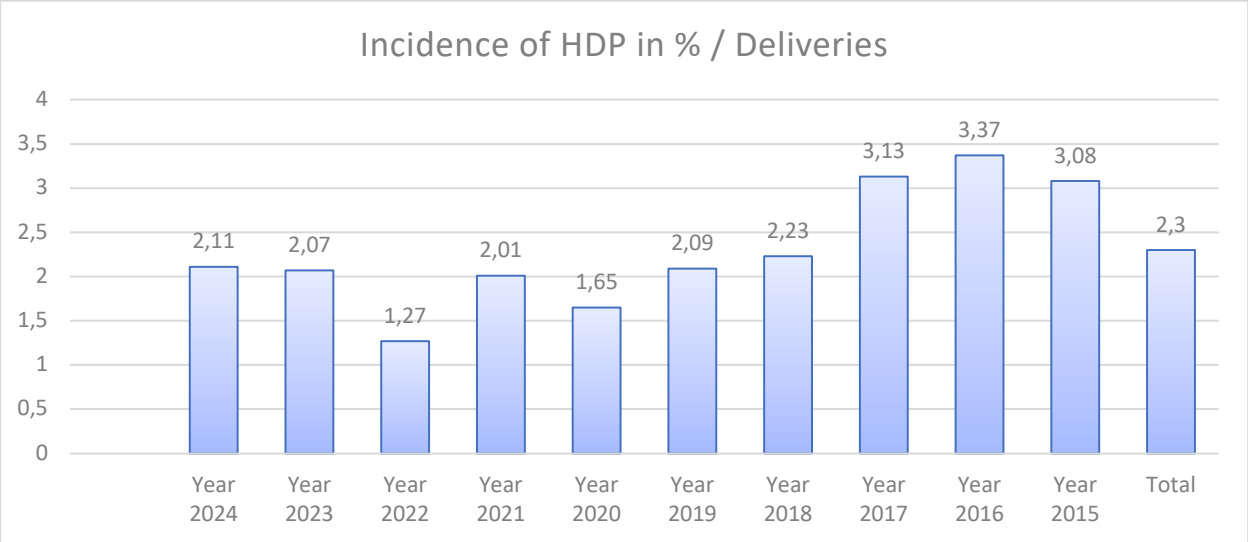

Figure 1. Incidence of hypertensive disorders of pregnancy over time.

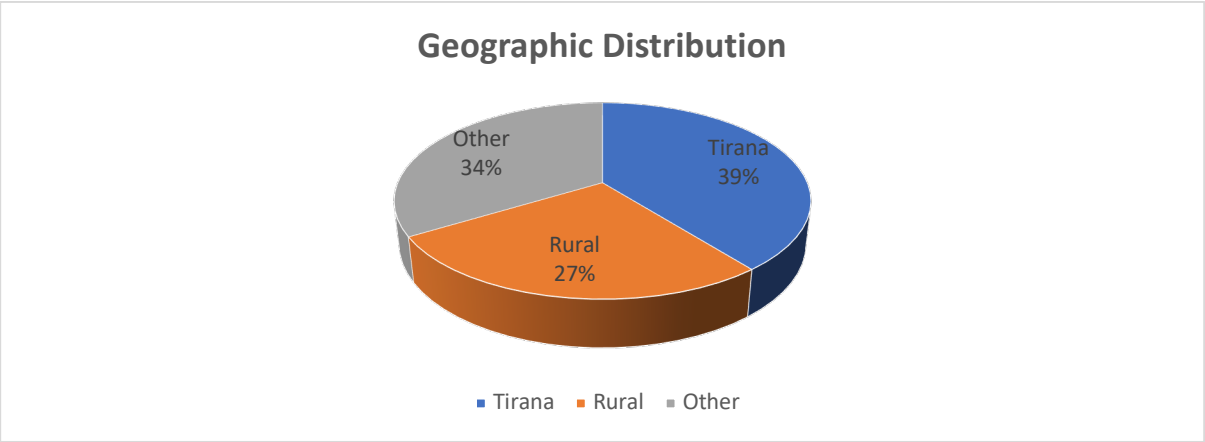

Figure 2. Geographic distribution.

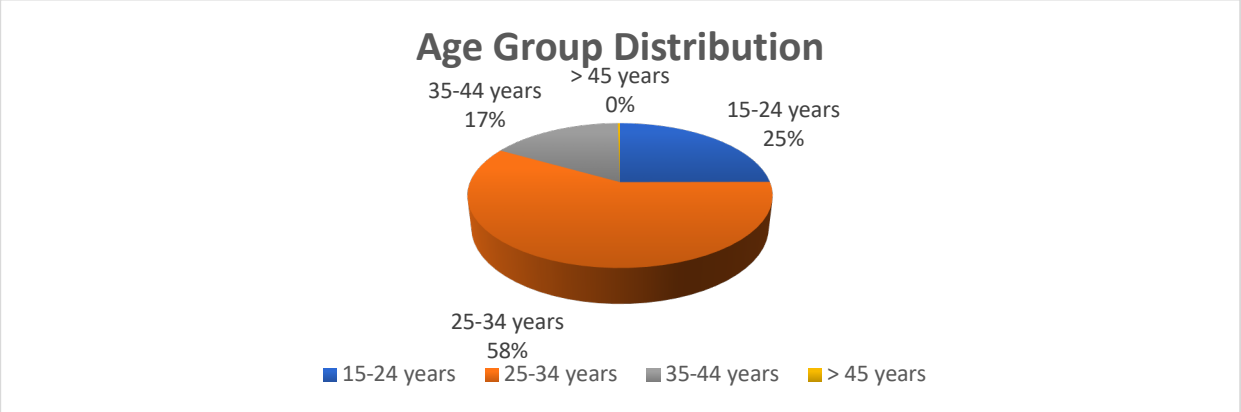

Figure 3. Age group distribution.

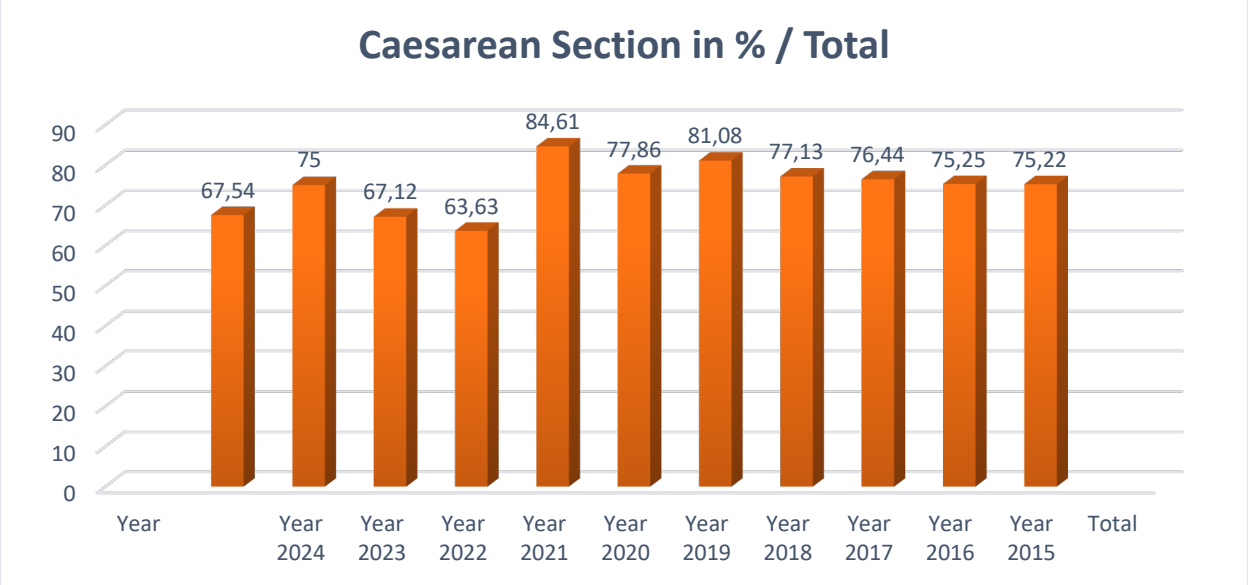

Figure 4. Cesarean section trend.

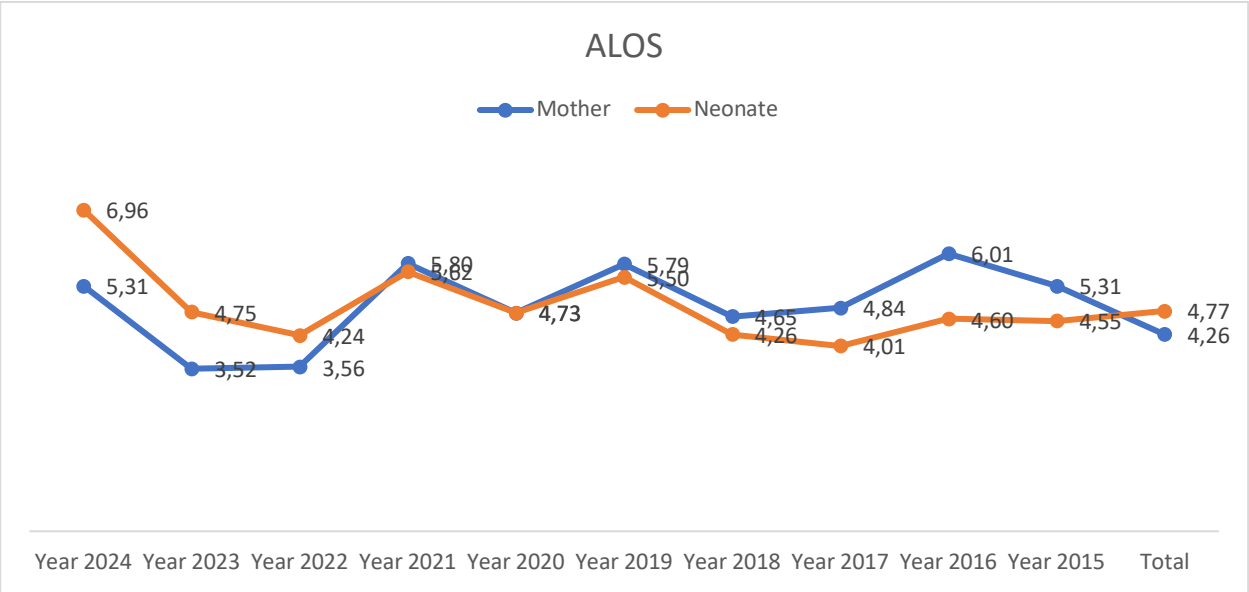

Figure 5. Average length of stay trend.