Prevalence rate and risk factors for preeclampsia and eclampsia among pregnant women attending Qena University Hospital During COVID-19 pandemic

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Abstract

Background: Preeclampsia and eclampsia are vital causes of maternal morbidity and mortality around the world. In Egypt, it complicates about 6%-8% of all pregnancies and can reach up to 15% in referral centers like university hospitals.

Objectives: To identify the prevalence of preeclampsia and eclampsia among pregnant women attending Qena University Hospital during the COVID-19 pandemic. Also, to identify possible risk factors associated with preeclampsia.

Patients and methods: The prevalence and risk factors for preeclampsia and eclampsia were estimated in this cross-sectional study of 300 pregnant women after 20 weeks of gestation. There were two groups: preeclamptic women and non-preeclamptic women. A structured questionnaire was used.

Results: The study revealed that the percentage of preeclampsia and eclampsia was 19% and 1%, respectively. The significant risk factors predisposing to preeclampsia were obesity, improper antenatal care, previous COVID-19 exposure, prior preeclampsia, cats' handling, pregestational diabetes mellitus, multifetal pregnancy, family history of hypertension, and advanced maternal age. By logistic regression analysis, BMI was the most contributing factor associated with preeclampsia (p- value <0.0001).

Conclusion: Preeclampsia became increasingly common during the COVID-19 pandemic, with preeclampsia and eclampsia prevalence rates of 19% and 1%, respectively. The most contributing factors to preeclampsia were obesity, which is a preventable risk factor, infrequent antenatal visits, and COVID-19 exposure. Proper antenatal care is an important part of prevention and early detection of preeclampsia, especially for women with previous COVID-19 exposure.

Keywords: Preeclampsia; COVID-19; Obesity; Antenatal care, Qena

DOI: 10.21608/svuijm.2022.147371.1330

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Received: 28 June,2022.

Revised: 6 July,2022.

Accepted: 21 July,2022

Cite this article as: Rania Abd El Hakeem Ameen, Ahmed M. M.Hany , Abd El-Naser Abd-El Gaber Ali (2023). Prevalence rate and risk factors for preeclampsia and eclampsia among pregnant women attending Qena University Hospital During COVID-19 pandemic. *SVU-International Journal of Medical Sciences*. Vol.6, Issue 1, pp: 29-37 .

Introduction

Preeclampsia is a pregnancy-related disorder characterized by hypertension, peripheral edema, and proteinuria. It's defined as a systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mm Hg on two occasions after 20 weeks of pregnancy, as well as proteinuria of more than 300 mg in 24 hours. It is also one of the leading causes of maternal and neonatal morbidity and mortality, affecting 2%-8% of pregnancies **(Rao et al., 2022).**

Pregnant women who had a SARS-CoV-2 infection had a considerably higher risk of developing preeclampsia than those who did not (**Conde-Agudelo and Romero, 2021**).The 2019 National Institute for Health and Care Excellence (NICE) guidelines classified preeclampsia according to risk factors into: (1) women are at high risk of preeclampsia if they have a history of hypertensive disease during a previous pregnancy or a maternal disease including chronic kidney disease, autoimmune diseases, diabetes, or chronic hypertension. (2) Women are at intermediate risk if they are nulliparous, ≥40 years of age, have a body mass index (BMI) ≥35 kg/m, have a family history of preeclampsia, a multifetal pregnancy, or a pregnancy interval of more than 10 years**(Fox et al.,2019).**

Eclampsia is defined as the development of convulsion and/or unexplained coma during pregnancy or postpartum period. It is one of the leading causes of high maternal mortality and morbidity and high perinatal mortality. The World Health Organization estimates that eclampsia is the cause of 12% of all maternal deaths globally **(Nobis and Hajong,2016)**. The prevalence of preeclampsia in Egypt is approximately 6% - 8% of all pregnancies and can be as high as 15% in referral centers such as university hospitals **(Alsokary et al., 2014)**. The prevalence of eclampsia in Egypt is around 0.3% **(Gabal et al., 2017).**

The current study aimed to identify the prevalence and risk factors for preeclampsia and eclampsia among pregnant women attending Qena University Hospital during the COVID-19 pandemic.

Patients and methods

A cross-sectional study was conducted to determine the prevalence and risk factors of preeclampsia and eclampsia among pregnant women attending department of obstetrics and gynecology at Qena university hospital. The participants were selected by simple random sample. Data were collected on a practice base from pregnant women attending obstetrics and gynecology department. Sample size was estimated to determine a prevalence of preeclampsia and eclampsia among pregnant women of 19% and 1% respectively. The following formula was used

$$n = \frac{Z^2 p(1-p)}{d^2}$$

where **n** is the sample size, **Z** is standard normal variant (at 5% type 1 error (P<0.05) it is 1.96, **P** (expected proportion in population based on previous studies) = 10%, **d** (absolute error or precision) =0.05, the level of confidence usually aimed for is 95%. The estimated sample size was 140, we raised it up to 300 participants.

Inclusion criteria

All pregnant women with gestational age more than twenty weeks attend to Qena University Hospital and approved to participate in the study were enrolled.

Exclusion criteria

Pregnant women with chronic hypertension, Pregnant women with neurological problems, and Pregnant women with chronic kidney disease.

Data collection

Data were collected during December 2021 to March 2022. The interviews were targeting pregnant women attending Qena University Hospital. A structured questionnaire was used as a tool for data collection. The questionnaire was adapted from different literatures of similar Studies in English to increase the comparability of

the finding. It is filled by interviewing the pregnant women about the following:

1) Socio economic and demographic characteristics: include age, residence, women's occupation, and women's education.

2) Obstetric history: Gravidity and parity, gestational age, twin pregnancy, and previous pregnancies.

3) History of predisposing medical diseases such as D.M, renal disease, and present history of taking treatment for hypertension.

4) Past history: which includes history of preeclampsia during previous pregnancies, drug intake, history of edema of both lower limbs and proteinuria in previous pregnancies.

The studywas approved by the ethical committee of Qena Faculty of Medicine in 10/2021.The ethical approval code: SVU-MED-COM009-1-21-10-250

Statistical analysis

All the statistical analyses were done using the IBM SPSS (Statistical Package for the Social Science; IBM Corp, Armonk, NY, USA) release 26 for Microsoft Windows for data analysis). Qualitative variables were recorded as frequencies and percentages and were compared by chi-square test. Quantitative measures were presented as means ± standard deviation (SD) and were compared by student t- test. Regression analysis and correlation between different variables were performed as indicated. P value < 0·05 will be significant.

Results

A total of 300 pregnant women in reproductive age (15-49) were included in the study; the mean age was 28.39+6.39 years. The prevalence of preeclampsia and eclampsia was 19% and 1% respectively. Most of the pregnant women were housewife (89%) and only (11%) were working. 52% of them were in the age group (20- <30) and 84% were from rural areas. From the total number of studied women, 46% had attended below secondary education. Relationship between preeclampsia and demographic characteristics is shown in **(Table.1)**.Frequency distribution of preeclampsia according to age group is shown in **(Fig.1).**

Regarding health care characteristics of studied women, the mean BMI was 26.76±3.13(28%) of women included in the study were of healthy weight, (57%) were overweight, and (15%) were obese. Also, (8%) of studied women had previous COVID-19. Concerning family history, (9%) of studied women had family history of preeclampsia and (36%) had family history of hypertension. Regarding consanguinity (36%) had positive consanguinity. Relationship between preeclampsia and health care parameters is shown in **(Table. 2)**, where there is statistically significant relation between preeclampsia and BMI, Previous COVID-19(P value < 0.001) for both. Frequency distribution of preeclampsia according to BMI is shown in (**Fig.2**).

Regarding the obstetric characteristics of studied women. Among the pregnant women, (52%) were ≤ 32 weeks gestational age compared to (47%) more than 32 weeks. Also, (21.3%) were primigravida while (78.7%) were multigravida. Also, (93%) had single gestation and (7%) had multiple gestations. (3%) of studied women had pregestational diabetes. Regarding previous pregnancy (90.7%) of studied women had prior preeclampsia. concerning antenatal visits 46.3% have infrequent antenatal visits.

Relationship between preeclampsia and obstetric characteristics is shown in **(Table.3),** where there is there is statistically significant relation between preeclampsia and pregestational diabetes mellitus, frequency of antenatal visits (P value < 0.0001) for both.

By logistic regression analysis for factors affecting preeclampsia, there were ten risk factors associated with the development of preeclampsia among the women studied at Qena University Hospitals. The most contributing risk factors for preeclampsia were obesity(P-value< 0.001) ,overweight (P-value< 0.001),infrequent antenatal visits(p-value < 0.001), and previous COVID-19(P-value<0.001), prior preeclampsia(p-value 0.002), dealing with cats (p-value 0.002), then pregestational D.M(p- value 0.003) , multiple gestation(p-value < 0.01),and family history of hypertension (p-value 0.013) and the least

contributing risk factor was advanced maternal age (p-value 0.025), (**Table.4**).

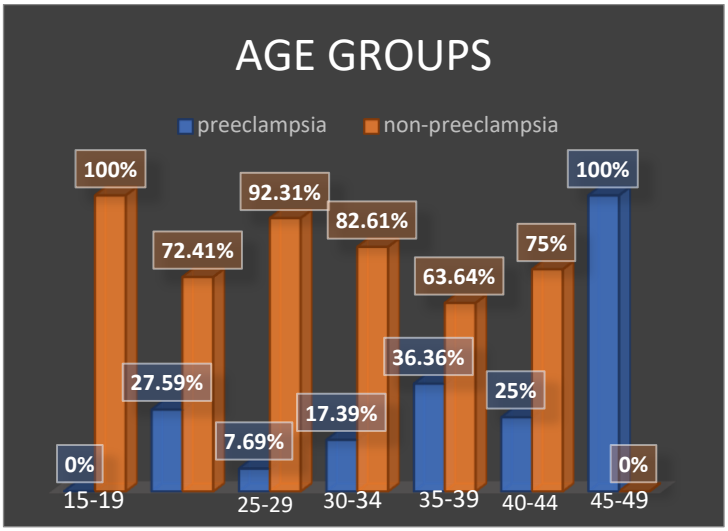

Fig.1. Frequency distribution of preeclampsia according to age group

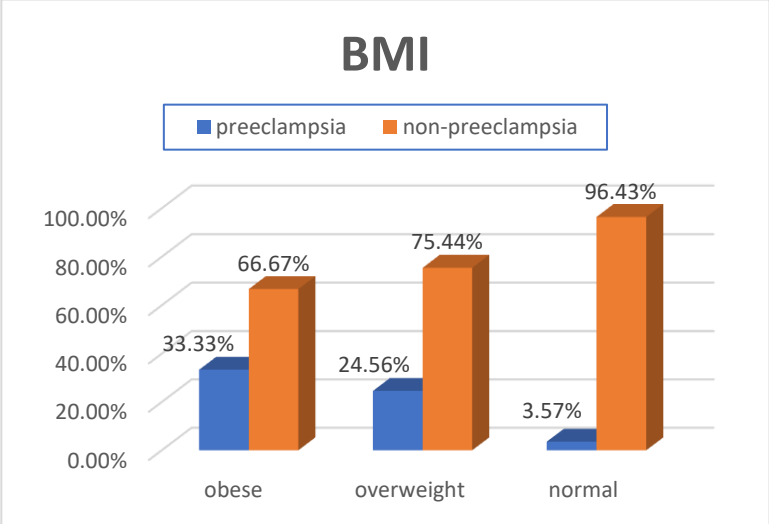

Fig.2. Frequency distribution of preeclampsia according to BMI of the studied women

Table 1. Relationship between preeclampsia and demographic characteristicsof the studied women

Parameters		**Preeclampsia (N=60)**	**Non-preeclampsia (N=240)**	**P value**
	Total	N (%)	N (%)	
Age group				
15-19	18	0(0%)	18(100%)	**<0.0001***
20-24	87	24(27.59%)	63(72.41%)	
25-29	87	6(7.69%)	72(92.31%)	
30-34	69	12(17.39%)	57(82.61%)	
35-39	33	12(36.36%)	21(63.64%)	
40-44	12	3(25%)	9(75%)	

45-49	3	3(100%)	0(0%)	
Family size				
2	66	15(22.73%)	51 (77.27%)	**0.020***
3	63	12(19.05%)	51(80.95%)	
4	75	6(8%)	69(92%)	
5	69	18(26.09%)	51(73.91%)	
6	27	9 (33.33%)	18 (66.67%)	

*Chi square testis significant when p value is less than 0.05

Table 2. Relationship between preeclampsia and health care characteristics of the studied women

Parameters		**Preeclampsia (N=60)**	**Non-preeclampsia (N=240)**	**P value**
	Total	N (%)	N (%)	
BMI				
Normal	84	3(3.6%)	81(96.4%)	**<0.0001***
Overweight	171	42(24.6%)	129(75.4%)	
Obese	45	15(33.3%)	30(66.7%)	
Smoking exposure				
Yes	165	30(18.2%)	135(81.8%)	**0.384**
No	135	30(22.2%)	105(77.8%)	
Previous COVID-19				
Yes	24	12(50%)	12(50%)	**<0.0001***
No	276	48(17.4%)	228(82.6%)	
Family history of hypertension				
Yes	108	30(27.8%)	78(72.2%)	**0.012***
No	192	30(15.6%)	162(84.4%)	

*Chi square test is significant when p value is less than 0.05

Table3. Relationship between preeclampsia and obstetric characteristics of the studied women

Parameters		**Preeclampsia (N=60)**	**Non-preeclampsia (N=240)**	**P value**
	Total	N (%)	N (%)	
Gestational age				
≤32 weeks	158	42(26.58%)	116(73.4%)	**0.003***
>32weeks	142	18(12.68%)	124 (87.3%)	

Gravidity				
Primigravida	64	15(23.4%)	49(76.6%)	**0.438**
Multigravida	236	45(19.1%)	191(80.9%)	
Gestation				
Single	279	51(18.28%)	228(81.72%)	**0.007***
Multiple	21	9(42.86%)	12(57.14%)	
Prior preeclampsia				
Yes	28	12(42.9%)	16(57.1%)	**0.001***
No	272	48(17.6%)	224(82.4%)	
Pregestational diabetes				
Yes	9	6(66.7%)	3(33.3%)	**<0.001***
No	291	54(18.6%)	237(81.4%)	
Cats 'handling				
Yes	18	9(50%)	9(50%)	**0.001***
No	282	51(18.1%)	231(81.9%)	
Antenatal visits				
Frequent	161	13(8.1%)	148(91.9%)	**<0.001**
Infrequent	139	47 (33.8%)	92(66.2%)	

* Chi square test is significant when p value is less than 0.05

Table 4. Multivariate Logistic regression analysis for factors affecting preeclampsia among the studied women at Qena University Hospitals

Variable	Odds ratio OR	95% CI		P Value
		Lower	Upper	
Obesity (BMI≥30)	3.083	2.132	4.459	**<0.0001**
Overweight (BMI≥25≤30)	1.519	1.331	1.735	**<0.0001**
Infrequent antenatal visits	2.043	1.659	2.517	**<0.0001**
Previous Covid-19	4	1.892	8.455	**<0.0001**
Prior Preeclampsia	3	1.50	5.999	**0.002**
Cats 'handling	4	1.660	9.639	**0.002**
Pregestational DM	8	2.060	31.068	**0.003**
Multiple gestation	3	1.326	6.789	**0.010**
Family history of hypertension	1.538	1.126	2.102	**0.013**
Advanced maternal age >35	2.4	1.439	4.002	**0.025**

Discussion

Preeclampsia is a multi-organ system pregnancy disorder that causes a high frequency of maternal morbidity and mortality around the world **(Mou et al., 2021),** and affects about 2–8% of pregnant women **(Miller et al., 2022)**. Eclampsia is a major life-threatening complication of hypertensive disorders of pregnancy that is described as the onset of convulsions in combination with preeclampsia **(Mahran et al., 2017)**.In Egypt, the condition complicates 6% to 8% of all pregnancies and can reach 15% in referral centers such as university hospitals**(Alsokary et al., 2014)**.

The current study analyzed the prevalence of preeclampsia and eclampsia among pregnant women at Qena University Hospital and identified potential risk factors. The total prevalence of preeclampsia and eclampsia was 19% and 1%, respectively. According to our findings, preeclampsia is a major obstetric concern among pregnant women in upper Egypt, as described by **Abbas et al., 2016** in Assiut, upper Egypt, where preeclampsia was the leading cause of maternal mortality, accounting for 27.7 %of all preventable causes. The current study's prevalence of preeclampsia is substantially identical to that of **Agrawal et al., 2014** in Haryana, India (18.5 %).On the other hand, the predominance of preeclampsia in the present study is higher than a study conducted by **Shaaban,2006**in Egypt (15%), and by **Mou et al., 2021** in Bangladesh (14.4%). probable reasons for the higher prevalence of preeclampsia in our study were the inclusion of the participants from their second and third trimesters of pregnancy, whereas in other studies they included pregnant women from all three trimesters, and it is done during Covid-19 pandemic which is a strong risk factor for preeclampsia.The prevalence of eclampsia in our study is nearly equal to that conducted by **Mahran et al., 2017** at Minia Maternity University hospital, Egypt (1.2%). It is much higher than a study conducted by **El deeb et al., 2015** in Zagazig university hospital(0.3%),while lower than that reported by **Guida et al., in 2022** in Brazil (1.6-7.2%).

The present study identified that there is statistically significant relation (p<0.001) between preeclampsia and women's age, preeclamptic women were older (29.6±7.32) than non-preeclamptic women (27.69±5.83). Preeclampsia was higher among women within age group 45-49 years than other age groups. This is congruent with the study conducted by **El deeb et al.,2015** in Egypt who found that the highest incidence of preeclampsia was in women aged more than 40 years. Regarding family size, the current study showed that there is a statistically significant difference(p=0.02) between preeclamptic and non-preeclamptic women. Preeclamptic women had a larger family size than non-preeclamptic women. Preeclampsia was higher among women with a family size of 6 members (33.3%) than those with a smaller family size. These findings go in line with a study conducted in Sharkia, Egypt by **Gabal et al., 2017** that found there is a significant difference between normotensives and hypertensives regarding family size.

Also, we found that preeclampsia is significantly (p <0.001) higher among obese women (33.3%) than overweight (24.6%). These results agree with a study conducted by **Pare et al., 2014** in Boston and Philadelphia who found that being overweight or obese was the most important risk factor for preeclampsia. Also, we revealed that there is a statistically significant difference (p value = 0.003) between preeclampsia and gestational age where early onset preeclampsia (70%) is more prevalent than late onset preeclampsia (30%).

Multi-fetal pregnancy was associated with a significantly (p-value = 0.007) increased risk of preeclampsia, as it was more common among pregnant women with multiple gestations (42.9%) than those with single gestations (18.3%), which is consistent with a study conducted in Australia by **Francisco et al., 2022** who stated that twin pregnancies are an important risk factor for preeclampsia**.** Prior preeclampsia was significantly (p value = 0.001) associated with higher risk of preeclampsia in our study, as it was more common in pregnant women with a history of previous preeclampsia (42.9%) than those without prior

preeclampsia (17.6%). These findings agree with that of **Demissie et al., 2022** in Ethiopia, who revealed that a history of preeclampsia in a previous pregnancy was associated with an increased risk of preeclampsia.

An INTERCOVID prospective study was conducted by **Papageorghiou et al.,202 1**in America to assess the relationship between preeclampsia and COVID-19 and found that COVID-19 was greatly associated with preeclampsia. This completely agrees with our study as 50% of pregnant women with previous Covid-19 had preeclampsia compared to 17.4% in those without previous COVID-19.Also, pregestational diabetes was significantly ($p < 0.001$) associated with an increased risk of preeclampsia, as 66.7% of women with pregestational diabetes had preeclampsia compared to 18.6% of those without, which agrees with the findings of **Gabal et al., 2017** in Sharkia. Also, we revealed a statistically significant($p<0.001$) relationship between preeclampsia and antenatal care, as 33.8% of pregnant women with infrequent antenatal visits suffered from preeclampsia compared to 8.1% of those with frequent antenatal visits. These findings are in line with **Hamzah et al., 2021** in Indonesia, where irregular antenatal visits are 1.095 times more likely to develop preeclampsia than regular antenatal visits. Also, there is a significant relationship between preeclampsia and cat handling as preeclampsia was higher among women who deal with cats (50%) than those who don't (18.1%). These findings are consistent with those of **Alshareef et al.,2018** in Sudan, who discovered that women with T. gondii IgG seropositivity were 9.4 times more likely to develop preeclampsia.

Conclusion

Preeclampsia and eclampsia represent major risks to maternal and neonatal lives in Qena University Hospital. These issues became increasingly common during the COVID-19 pandemic, with preeclampsia and eclampsia prevalence rates of 19% and 1%, respectively. Significant risk factors predisposing to the development of preeclampsia were obesity, overweight, infrequent antenatal visits, previous COVID-19 exposure, prior preeclampsia, cat's handling, pregestational diabetes mellitus, multiple gestation, family history of hypertension, and older maternal age. Proper antenatal care is an important part of prevention and early detection of preeclampsia, especially for women with previous COVID-19 exposure. All overweight or obese women should be offered nutrition counseling and encouraged to share in an exercise program.

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