



Long working hours and obstetric complications: A cross-sectional study among female doctors[☆]

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ABSTRACT

Objective: To investigate the effects of long working hours on pregnancy complications and obstetric outcomes among female doctors working in tertiary care hospitals of Karachi.

Study design: A cross-sectional study was conducted on 149 female MBBS graduates (mean age: 33.5 ± 7.3 years) who had conceived at least once, currently working in two tertiary-care hospitals of Karachi. Data was collected through a self-administered questionnaire containing questions regarding demography and course of 1st pregnancy of the participants including working hours, antenatal and natal complications. Means and standard deviations were calculated for continuous variables with frequencies and percentages for categorical variables. The association between long working hours and different antenatal and natal complications was investigated using Chi-square test and T-test.

Results: Out of 149 participants included in final analysis, 85.9 % doctors gave birth to alive babies while 12.8 % had miscarriages and 1.3 % had stillbirth. Mean working hours during the three trimesters were found to be 53.76, 53.66 and 48.7, respectively. 43 % doctors experienced at least one antenatal complication during their pregnancy. Women who worked more than or equal to 55 h per week during 1st, 2nd and 3rd trimester of their pregnancy experienced more antenatal complications than women who worked less than 55 h (p-value=0.042, 0.021 and 0.018 respectively). 61.7 % females experienced at least one natal complication, most common of which was induction of Labour (39.1 %). Natal complications were significantly associated with increased workload during 2nd trimester (mean 58 vs 46 h, p-value 0.040). Doctors belonging to surgical specialty had 2.7 times higher risk of developing at least one natal complication than doctors of medical specialty (95 % CI: 1.235–5.870).

Conclusion: Long working hours during pregnancy are associated with antenatal complications among female doctors. Natal complications were only significantly related to long working hours during 2nd trimester of pregnancy, however, female surgeons are more prone to develop natal complications than doctors belonging to medical specialties.

1. Introduction

In Pakistan, more than two-third of medical students are females [1]. In the past decade, more women are pursuing careers in medicine and surgery, now having equal representation as men in residency programs [2]. However, the prime childbearing period of female doctors coincides with their medical training years. This leads to planned delays in pregnancies resulting in greater infertility rates, miscarriages and obstetric

complications among doctors as compared to general population [3].

Doctors, especially female doctors, have a very stressful lifestyle with challenging studies and academics, long working hours of on average 74–92 h per week [4], frequent night shifts/calls, high professional responsibility, psychological/emotional stress and difficulty in managing work-personal life balance leading to high rates of burnout among doctors [5,6]. Due to stressful lifestyle, advanced age at childbearing and long working hours, doctors are prone to high risk pregnancies. A

[☆] Study was conducted in Karachi, Sindh, Pakistan.

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study carried out in Hungary in 2014 demonstrated a higher prevalence of reproductive disorders such as infertility, miscarriages and high-risk pregnancies among female physicians as compared to non-physicians [5]. 19.3 % of female doctors experienced pregnancy complications in a French survey with surgeons being more prone as compared to physicians [7]. A study on US surgeons concluded that female surgeons were more likely to experience miscarriages (42 %) and major pregnancy complications (48 %) as compared to non-surgeon female partners of male surgeons [8].

Multiple researchers have compared pregnant females having profession outside home (working women) with homemakers and studied the effects of this kind of work on various pregnancy outcomes and complications [9–11]. One survey compared the prevalence of infertility and pregnancy complications among female physicians to that of the general public and the results show that female physicians had higher rates of miscarriage and preterm birth, were older at the time of their first pregnancy, and more frequently underwent evaluation and treatment for infertility [9]. A study from Finland showed that there was a higher prevalence of instrumental deliveries among practical nurses as compared to housewives [10]. Likewise, a study from Tehran showed a 5-fold increase in the incidence of low birth weight babies among employed mothers as compared to homemakers [11].

Several studies have also shown that working for longer periods during pregnancy is associated with antenatal complications especially threatened abortion, preterm labour and hypertensive disorders of pregnancies along with complicated deliveries as well [12–14]. A study on Swedish Health care employees demonstrated an increase in the risk of preterm birth among those who frequently worked night shifts or had longer working weeks [15].

Long working hours are potentially associated with mental, psychological as well as physical impacts on the pregnant female’s body that can lead towards complicated pregnancies and sometimes towards

miscarriages as well. But limited literature is available regarding effects of long working hours on obstetric outcomes among various professions especially doctors in Pakistan. Hence, the aim of our study is to investigate the effects of long working hours on pregnancy complications and obstetric outcomes among female doctors working in tertiary care hospitals of Karachi.

2. Methodology

2.1. Study population

This cross-sectional study was conducted between May 2023 and October 2023 by using a self-administered survey completed by female doctors working in two tertiary care hospitals of Karachi. Our study population was female MBBS graduates, less than 60 years of age who had conceived at least once (with the outcome of their pregnancy known), currently working in different wards of Dr Ruth K. M. Pfau Civil Hospital, Karachi and Dow University Hospital, Ojha with the exception of Anaesthesiology and Radiology Departments. These departments had been excluded as exposure to anaesthetics gases and radiations might be additional risk factors for miscarriages, preterm birth and fetal anomalies [16,17]. We excluded women with multiple pregnancies (more than one fetus conceived at same time) because they are more likely to experience adverse pregnancy complications, including preterm birth (PTB) or bleeding [18]. See Fig. 1.

2.2. Sample size

The sample size was calculated to be 163 using OpenEpi. Version 3, taking hypothesized percentage frequency of outcome factor i.e. preterm labour as 12 % [12], at a confidence interval (CI) of 95 % with 5 % margin of error.

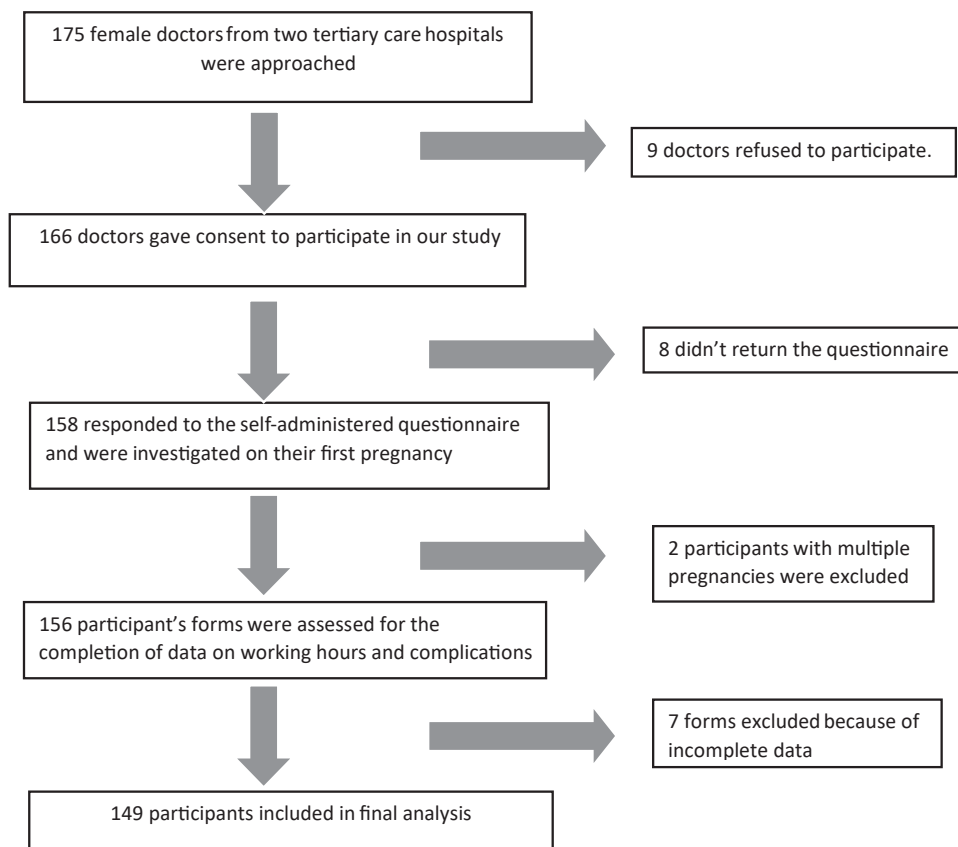


Fig. 1. Flow Chart of Study Population.

2.3. Data collection

Data was collected by purposive sampling through a structured self-administered 27-item questionnaire which included information regarding basic demography and the course of 1st pregnancy of study participants including their working hours, antenatal and natal complications, and their satisfaction level with workload and workplace support. We personally approached all female doctors currently working in the different departments of Civil Hospital Karachi and Dow University Hospital, Ojha. After inquiring about the fulfillment of inclusion criteria, hardcopies of the questionnaire were distributed amongst those who completely fulfilled the criteria. All procedures were approved by Institutional Review Board of Dow University of Health Sciences (No. 3003).

2.4. Operational definitions

Long working hours were defined as working ≥ 55 h per week including night shifts and calls (average working hours of doctors in the US [19]). **Antenatal complications** are defined as complications occurring during the course of pregnancy and include Threatened Abortion, Gestational Hypertension, Gestational Diabetes, Placenta Previa, Polyhydramnios and Oligohydramnios etc. **Natal complications** are defined as complications occurring at or around the time of delivery and include Abnormal labour, Induction of labour, Abnormal heart rate of the baby, Preterm premature rupture of membranes and Postpartum haemorrhage etc.

2.5. Statistical analysis

After excluding incomplete and invalid forms, a total of 149 participants were included in the final analysis of our study. Data analysis was performed using IBM SPSS Statistics Version 24. Means along with standard deviation were calculated for all continuous variables. Frequencies and percentages were calculated for categorical variables. The association between long working hours and different antenatal and natal complications was investigated using chi-square test and T-test. A p-value of less than 0.05 was considered as statistically significant.

3. Results

3.1. Demography

A total of 149 participants were included in the final analysis with the mean age of 33.5 ± 7.3 years. The mean age of participants at the time of MBBS graduation was 24 ± 1.02 years whereas it was 25.8 ± 2.6 years and 26.7 ± 2.5 years at the time of marriage and 1st pregnancy, respectively. Female doctors took an average of 8 ± 10.9 months after marriage to conceive their 1st child. The demographic characteristics of study participants are summarized in Table 1.

3.2. Pregnancy outcome and workload

First pregnancy of 85.9 % doctors resulted in alive birth, 12.8 % ended up in Miscarriage and 1.3 % in Stillbirth. 41.6 % doctors had a workload of less than 55 h per week during 1st trimester whereas majority i.e. 58.4 % doctors worked for ≥ 55 h. During their 2nd trimester, 40.0 % doctors worked for less than 55 h whereas 60.0 % doctors worked for ≥ 55 h per week. In the 3rd trimester, 48.5 % participants worked for less than 55 h and 51.5 % worked for ≥ 55 h per week. The working hours of female doctors during their 1st pregnancy along with night shifts and calls is summarized in Table 2.

3.3. Pregnancy complications

Out of 149 doctors, 43 % experienced at least one antenatal

Table 1
Demographic characteristics (n = 149).

	N ^a	% ^b
Specialty		
Medicine	87	58.4
Surgery	57	38.3
Maternal Age at conception		
21–25 years	33	22.1
26–30 years	105	70.5
31–35 years	10	6.7
> 35 years	1	0.7
Consanguinity		
Consanguineous Marriage	25	16.8
Non-consanguineous Marriage	124	83.2
Status at Conception		
MBBS Student	10	6.7
House Officer	18	12.1
After House job	8	5.4
Resident Medical Officer	24	16.1
Resident	78	52.3
Consultant	6	4.0
Mode of Conception		
Spontaneous	144	96.6
After treatment	4	3.4
Co-morbidities		
Diabetes	4	2.7
Hypertension	3	2.0
Others	8	5.4
None	134	89.9
Consumption of Multivitamins		
Yes	132	90.6
No	14	9.4
Outcome of 1st Pregnancy		
Alive birth	128	85.9
Miscarriage	19	12.8
Stillbirth	2	1.3

^a the numbers in each category may not add up to total if the data contains missing variables.

^b the percentages in each category may not add up to 100 % if the data contains missing variables.

Table 2
Workload during 1st Pregnancy.

	Mean (SD)
Working Hours per Week	
1st trimester	53.76 (28)
2nd trimester	53.66 (28.4)
3rd trimester	48.7 (28.5)
Night Shifts per Month	
1st trimester	4 (3.6)
2nd trimester	4 (3.7)
3rd trimester	3.6 (3.5)

SD (Standard Deviation).

complication during their 1st pregnancy with Threatened abortion (15.5 %) and Gestational Diabetes Mellitus (9.4 %) being the most frequent. It was found that women who worked ≥ 55 h per week during 1st, 2nd and 3rd trimester of their pregnancy experienced more antenatal complications than women who worked less than 55 h (p-value = 0.042, 0.021 and 0.018 respectively). In terms of odds ratio, doctors who worked more than 55 h per week had a two-fold higher risk of developing antenatal complications as compared to those who worked less than 55 h (Table 4 and Fig. 2). Moreover, it was found that increased work load during 1st and 2nd trimester (i.e., working ≥ 55 h/week) is significantly associated with increased risk of Placenta Previa (p-value = 0.023 and 0.017 respectively).

Majority of the women (61.7 %) experienced natal complications during their pregnancy while 38.3 % had no natal complications. Induction of labour was found to be the most common natal complication among women (39.1 %). Natal complications were more frequent

Table 3
Pregnancy complications.

	N	%
Antenatal Complications		
Threatened abortion	23	15.4
Gestational Diabetes	14	9.4
Gestational Hypertension	10	6.7
Placenta Previa	11	7.4
Oligohydramnios	9	6.0
Polyhydramnios	2	1.3
Preeclampsia	7	4.7
Others	15	10.1
None	84	56.4
Natal Complications		
Induction of Labour	52	39.1
Abnormal Heart rate of Baby	17	12.8
PPROM	12	9.0
Abnormal Labour	26	19.5
Excessive Bleeding	6	4.5
None	51	38.3
Others	7	5.3
Mode of Delivery		
Normal vaginal delivery	58	43.0
Forceps or vacuum delivery	12	8.9
Planned Cesarean section	16	11.9
Emergency Cesarean section	49	36.3
Duration of Gestation		
Preterm	16	12.0
Term	117	88.0
Birth Weight		
Less than 2.5 kg	15	11.9
2.5 to 4 kg	109	86.5
More than 4 kg	2	1.6

among doctors who had longer working weeks during their pregnancy but the association was statistically significant only for 2nd trimester (mean 58 hrs vs 46 hrs, p-value = 0.040 t-test). However, increased risk of Preterm Premature Rupture of Membranes (PPROM) was found to be significantly associated with workload of ≥ 55 h per week during 3rd trimester of pregnancy (p-value = 0.006). It was also found that doctors belonging to surgical specialty had a 2.7 times higher risk of developing at least one natal complication as compared to those working in medicine (95 % CI: 1.235–5.870). Table 4 and Fig. 3 show the association of antenatal and natal complications with weekly working hours.

The first baby of about half of study participants i.e. 51.9 % was delivered through vaginal route whereas 48.1 % underwent caesarean section. A total of 16 doctors (12 %) had preterm deliveries. The mean birth weight of the newborns were found to be 2.9 ± 0.55 kg. The mean duration of maternity leave was 86 ± 29 days with majority doctors being allowed the standard maternity leave of 90 days (3 months). There was no statistically significant association between increased workload

and preterm birth or low birthweight babies (Table 3).

Data was also collected regarding the satisfaction level of female doctors with workload and duration of maternity leave along with support of husband, family and workplace. Majority of the female doctors were not satisfied with the workload during their pregnancy. Rest of the results are summarized in Table 5.

4. Discussion

This study revealed a correlation between antenatal complications and long working hours. Women who worked ≥ 55 h/week during their first, second, or third trimester had a higher risk of developing antenatal complications. Additionally, working long hours during the first and second trimester was linked to an increased risk of placenta previa. While there was no significant association between doctors' working hours and the risk of natal complications, the incidence of PPRM was higher among women who worked ≥ 55 h during their third trimester.

Furthermore, the study found that female doctors in surgical specialties had a higher risk of developing natal complications than those in medical specialties (p value=0.012). A 2021 study of US female surgeons also showed a higher prevalence of pregnancy complications among female surgeons than non-surgeon female partners of male surgeons [8].

Long working hours during pregnancy have been linked to an increased risk of various pregnancy complications in several studies, including a Japanese study of women physicians that found a significant association between long working hours during the first trimester and threatened abortion and preterm labor [14]. A study published in 2003 regarding duty hours and pregnancy outcomes among OBGYN residents concluded that their pregnancy outcomes were not much adversely affected by long working hours [20] but there was a higher frequency of preterm birth, preeclampsia and fetal growth restriction among female residents when compared to spouses/partners of male residents who work with them.

As compared to the general population of Pakistan, female doctors have very high rates of Cesarean sections (48.9 % in doctors vs 11.3 %) but are less likely to have children with low birth weight i.e., less than 2.5 kg [21]. These finding could be attributable to a number of factors including increased age of doctors at 1st conception, stressful life, and long working hours as well.

Many of the published studies relating working hours with pregnancy complications showed that long working hours significantly increased the risk of threatened abortion and preterm labor. This finding is inconsistent with the results of our study, which could be due to several reasons. First, the sample size of our study was very small which could have resulted in type 2 error (false negatives). Secondly, the

Table 4
Association of workload and pregnancy complications.

		Work load per week		P-value (Chi-square test)	Odds Ratio (95 % Confidence Interval)
		Less than 55 h	≥ 55 h		
		N	N		
Antenatal Complications					
1st trimester	Yes	18	37	0.042	2.113 (1.022–4.369)
	No	37	36		
2nd trimester	Yes	16	39	0.021	2.372 (1.130–4.976)
	No	36	37		
3rd trimester	Yes	20	35	0.018	2.371 (1.155–4.867)
	No	42	31		
Natal Complications					
		No	Yes	P-Value (T-Test)	Odds Ratio (95 % Confidence Interval)
		Mean (SD)	Mean (SD)		
1st trimester		47.6 (30.2)	57 (26.8)	0.199	1.7 (0.827–3.500)
2nd trimester		46 (30.7)	58 (26.3)	0.040	1.75 (0.847–3.612)
3rd trimester		41.7 (30.2)	53 (27)	0.122	1.5 (0.753–3.160)

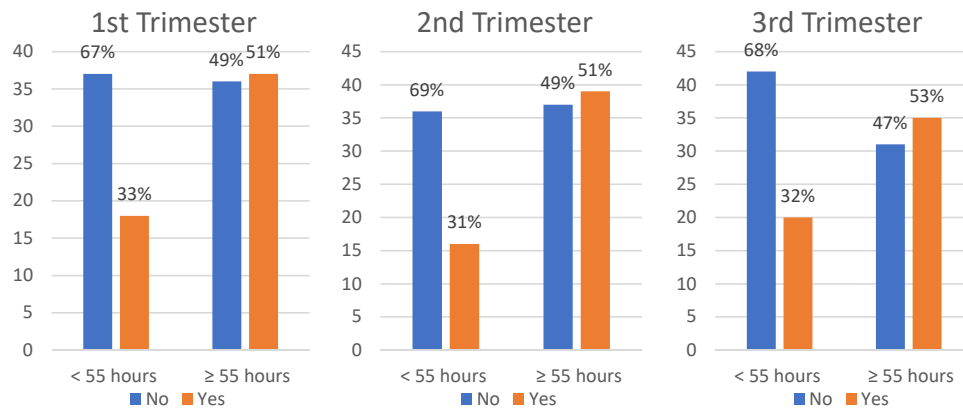


Fig. 2. Frequency of Antenatal complications during the three trimesters, according Workload per Week.

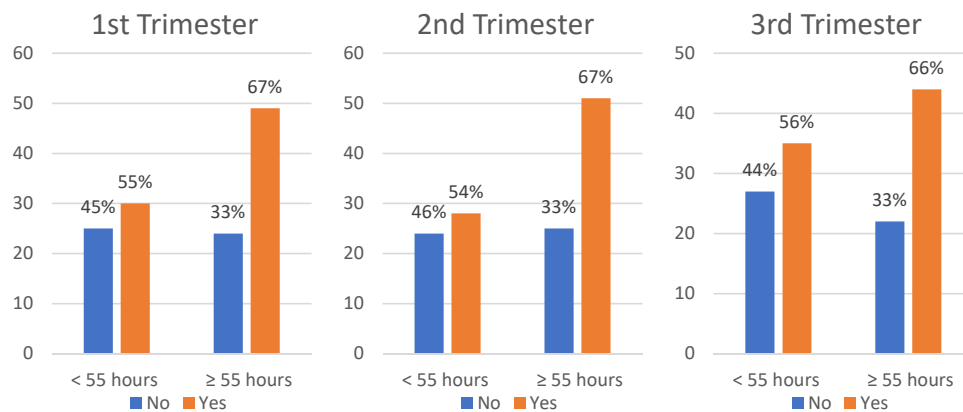


Fig. 3. Frequency of Natal complications during the three trimesters, according Workload per Week.

Table 5
Satisfaction Level.

	Very dissatisfied	Dissatisfied	Satisfied	Very satisfied
Workload	20.0 %	34.3 %	43.6 %	2.1 %
Maternity Leave	14.2 %	26.9 %	54.5 %	4.5 %
Support of Husband	1.4 %	4.1 %	56.2 %	38.4 %
Family Support	2.1 %	5.5 %	58.2 %	34.2 %
Workplace Support	12.1 %	32.1 %	51.4 %	4.3 %

studies quoted above have different cultural values as compared to Pakistan, furthermore, family and social support system of our culture could be a protective factor against adverse pregnancy outcomes. Lastly, since it is a retrospective study, there could have been a recall bias as well among the participants.

5. Limitations

The study had some limitations, including a small sample size and potential recall bias due to self-reported data. Additionally, we only included two public-sector tertiary care hospitals in Karachi, which may limit generalizability to all female doctors in Pakistan. Furthermore, we did not consider heterogeneity in exposure and workload across different medical and surgical specialties or conduct an inter-departmental analysis. Lastly, unmeasured factors such as BMI [22], lifestyle variables, emotional stress, and psychological burden related to long working hours may have influenced the results.

6. Conclusions

The results of this study demonstrate that long working hours during pregnancy are associated with antenatal complications among female doctors. Increase workload during 1st and 2nd trimester was related with higher incidence of developing Placenta Previa while increased workload during 3rd trimester was associated with increased risk of developing PPRM. Natal complications were significantly related to longer working hours during 2nd trimester; however, female surgeons are more likely to develop natal complications than female doctors belonging to medical specialties.

7. Recommendations

Changes should be made in the working hour policies to support pregnant female doctors, such as providing flexibility in their schedules and assigning less demanding tasks. This will allow them to manage their workload and appointments without excessive stress. Pregnant females should also be exempted from 24-hour calls during the third trimester of their pregnancy. There is a need to change this system of 24-hours calls and replace it with 12-hours shift work as this leads to less burnout among doctors along with decreasing medical errors ultimately leading to healthier doctors as well as patients [23].

Adequate maternity leave should be provided to pregnant female doctors to recover after childbirth, bond with their newborn, and adjust to new responsibilities while maintaining a healthy work-life balance [24]. Sweden has the longest paid parental leave of 480 days, while maternity leave for NHS doctors in the UK is allowed up to 52 weeks [25, 26]. Mental health support should be provided to recognize the emotional impact of pregnancy and the stressors associated with a

demanding profession [27]. Lactation support should be available to promote breastfeeding and support the health of both the mother and the newborn [28]. Additionally, educational programs, networking, and mentoring can assist pregnant doctors in sharing their experiences and raising awareness about the issues they face.

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CRediT authorship contribution statement

Mehwish Maqsood: Writing – original draft, Resources, Methodology, Investigation. **Hasina M. Kadri:** Writing – review & editing, Supervision, Resources. **Hafsa Ahmed:** Writing – original draft, Methodology, Investigation. **Lawiza Asghar:** Software, Investigation. **Hasna Adil:** Writing – original draft, Project administration, Methodology, Formal analysis, Conceptualization. **Muhammad F. Iqbal:** Writing – original draft, Methodology, Investigation. **Misbah Nizamani:** Writing – original draft, Formal analysis, Data curation. **Tooba Hussain:** Writing – original draft, Software, Investigation. **Nabiha Syed:** Writing – original draft, Software, Investigation.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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