PAKISTAN: MATERNAL MORTALITY SURVEY, 2019

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ABSTRACT

This research paper uses data from the “Pakistan: Maternal Mortality Survey” of 2019 to assess how the health of the mother impacts the experience of pregnancy overall. The study involves a section on data curation that describes the data cleaning and merging process. The quality of data was also assessed to state the problems that might have been present in the survey.The data could have included variables such as genetic history so that our research might have been more in depth. The study runs inferential and descriptive statistics on the software STATA-18 to fully dive into the research question at hand. The regressions revealed that the overall health of the mother improved after pregnancy as it resulted in more visits to the hospital and healthcare facilities. Some descriptive visuals were included to provide an overview of the data landscape.These included histograms, scatter plots and boxplots to make correlations between different variables. The research paper includes a thorough literature review on the various factors that influence the pregnancy experience for women in Pakistan. The results of the study are then discussed in the last section and a conclusion of our study is provided at the end.

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INTRODUCTION

Regardless of our species, we all share a common experience—birth and all of us can agree on the universal truth, that we are a result of a successful pregnancy. Very few babies have been born as a result of complete genetic modification, or in lab cultures. But, for the larger population, we are a result of our biological mother getting pregnant. This is a beautiful, yet terrifying moment in any person's life. Millions have been through it since the start of time, and until technology advances beyond one's imagination, millions will continue to go through this journey. Pregnancy is a major milestone in one's life, whether wanted or unwanted and its scope is often overlooked. After acknowledging the universal nature of pregnancy, it's crucial to recognize that pregnancy experience can vary significantly based on factors such as geographical location, socio-economic status, and access to healthcare. This comes with various effects on one's life, but mainly with a variety of effects on health. Indeed, a pregnancy does change the person's physiology entirely. Where there are numerous health benefits for both; the biological mother and the baby, there can be severe complications. In Pakistan, where healthcare infrastructure and resources may be limited, the journey of motherhood takes on unique challenges and risks. And, in a developing country such as Pakistan, pregnancy can oftentimes result in health issues, and the pregnant women to die. This research paper is written with the intent to analyze the documented journey of mothers in Pakistan who filled out the DHS Survey, understand their experience in a quantified manner, and present them qualitatively. Hereonforth, "Pregnancy Experience" is used to describe the aforementioned journey. It is a combination term that encapsulates the health symptoms a mother faces pre-pregnancy, during it, and post-partum. We believe this is an adequate method, and will yield beneficial insights that can be used for further research. Effectively so, the research question for the paper is: "How did the mother's health contribute to the pregnancy experience overall?"

LITERATURE REVIEW

For understanding the research better, we shall first explore the topic through different literature and create a portion prior to explaining our findings. Maternal health is often overlooked in Pakistan, and various datasets and statistics support it. Pakistan remains at the top in the world's maternal mortality rates, and it is further worsened by the poor provision of healthcare which brings along a set of challenges faced by pregnant women. Seeing as Pakistan is still a developing country 75 years after its independence, there is a vast majority in poor socio-economic statuses, low levels of education, and disadvantaged in family planning. Hereonforth, this section of the paper will focus on the various factors that influence the pregnancy journey of women in Pakistan.

First and foremost, we must understand the healthcare seeking behaviors of people in Pakistan. This comes at the forefront due to the nature of the topic, and because any health concern directly impacts the pregnancy and potentially contributes to postpartum health issues. Healthcare is a universal right, and overlooked in Pakistan with the state of the system currently. Health system is defined by the World Health Organization (WHO) in the report of 2000 as "all the organizations, institutions, and resources that are devoted to producing health Actions" (WHO, 2000). Within Pakistan, just as most other countries, there are 2 types of systems, the Public Healthcare System, and the Private Healthcare System. However, unlike other countries, there is a massive disparity between both. The people prefer private systems because there is more guarantee of proper healthcare, and better treatment due to the poor structure in public hospitals. Often there is electricity shortage which leads to worsened health of admitted patients, a severe lack of funding. The taxpayers money is spent elsewhere as opposed to developing the healthcare system, and this resulted in the GDP revenue not being spent appropriately for healthcare as corroborated by Mashhadi et al's research. It showed that between 2013-2014, there was a decrease from 0.69% to 0.42%, as opposed to the 5% recommendation by WHO. Furthermore, their research also found that the Public Healthcare System fails maternal and child health care, and the basic necessities are accessed by NGOs and Community Outreach Programs, whereas the Private Healthcare System, although better but not quite as the expenditure is borne by the households at about 98% (Mashhadi et al., 2016).

In 2021, the gravity of the situation of the Public healthcare system in Pakistan for pregnant women was brought to light with Hameed et al's research. During which, they discovered that women faced violation of their universal right to access healthcare with citing the violations ineffective communication (100%); lack of supportive care (99.7%); loss of autonomy (97.5%); failure of meeting professional clinical standards (84.4%); lack of resources (76.3%); verbal abuse (15.2%); physical abuse (14.8%); and discrimination (3.2%) (Hammed et al., 2021). With even a normal (no complications) pregnancy putting women at high risk, these aforementioned practices of the Public Healthcare System do tend to explain why Pakistan's Maternal Mortality Rate (MMR), is what it is. When the public health care system fails to provide supportive care along with the required resources it leads to complications in labor and pregnancy, and overall contributes to a deteriorating pregnancy experience. The discriminatory behaviors and practices as evidenced by the statistics show the horrific yet daily reality of Pakistan.

As our findings have a variable for Antenatal Care, it is natural to qualitatively explore why there are barriers to it in Pakistan. One would assume in passing that it is due to a lack of awareness or perhaps the expectant mothers have access to midwives etc. However, in 2016 Nisar et al., discovered that the reasons for barriers were due to financial constraints, familial restrictions (from either husbands or mother-in-laws), the cost of time taken to travel, taking care of the house, and poor facilities with an unavailable staff. These factors resulted in women not receiving ANC services (Nisar, 2016). Thus, it is evident that low access is not due to unavailability but rather due to systemic issues, logistical barriers, and familial pressures. It is imperative to work upon these, as these severely contribute to a mother's and infant's wellbeing, and reduce the MMR.

We see developments in various forms across the world, be it technological, theoretical, infrastructure or even something as simple as modes of transportation. We have seen strides in development of healthcare, with one being that of contraceptive use and advancement in family planning. There is sex education given to students in Western countries, and the promotion of safe sex. With this came awareness for condoms, IUDs, Pills, and other birth control methods. Pakistan already suffers from poor education be it formal, informal, vocational and/or social. As

such, it is unsurprising that there is insufficient knowledge about family planning and contraceptive usage, as shown in Scatter Plot or fig. 3.2. Where there are factors for this, it is also considered a taboo to discuss these, and the hesitance also comes from having a lot of children to sustain the household (in rural areas). Mahmood & Ringheim's research titled "Factors Affecting Contraceptive Use in Pakistan" (1996), revealed that in the DHS of 1990-1991, 13% of women cited religion as a reason for lack of contraceptive use (Mahmood & Ringheim, 1996). Considering how Pakistan was formed on the basis of having a separate islamic nation for the Muslims of the Indian Subcontinent, it is unsurprising that the populus integrates religion into every aspect of their lives, and as an extension, consider the idea of family planning as a violation of their religion. Although untrue, however, with how religion is enforced in every area without proper interpretations of it, and using it as a tool to control lives especially of women, it is not shocking that contraceptives are avoided under the name of religion. Moreover, Habib et al's research within Aga Khan showed that despite 89.9% women being aware of contraceptives, only 33.4% reported using them (Habib et al., 2017). As we humans have the universal right to healthcare, we also have our right to our own practices, and it should be respected. However, the issue with the gap of contraceptive knowledge and practices arises when this in turn impacts the mother's health and the infants. Overlooked surely, but no contraceptive usage can lead to STDs such as HIV/AIDs, etc, it can also cause unwanted pregnancies, or at times lead to mothers having more children, and in turn impact their health for the worse. It does not end here, the familial dynamics come into play here too. The lack of family planning and using of contraceptives is also a result of having a strong desire to have more sons, low inter-spousal communication due to intimate talk being a taboo in Pakistan, and husband's approval for contraceptive usage (Mahmood & Ringheim, 1996; Hussain et al., 2000; Mumtaz and Salaway 2009). Lastly, there is also a fear of side effects from using contraceptives which leads to low usage of them (Hashmi et. al, 1993; Nishar et. al, 2013).

RESEARCH QUESTION

How did the mother's health contribute to the pregnancy experience overall?

DATA CURATION

For this study, we used data from the official website of Demographic and Health Surveys (DHS). We used a set of 7 datasets from the Maternal Mortality Survey conducted in 2019. In order to turn raw data into clean data that can be used for statistical analysis, we used the software StataMP 18. We started off by merging the set of 7 datasets into a combined master file. We used the household dataset as the master file since it had data for each individual member of the household. In the dataset, each member of the household can be identified by the line number, household number and cluster number.

Data merging:

When it comes to merging the 9 datasets provided by the DHS surveys, we have the following 9; The "Births Raw" dataset, the "Children's Raw" dataset, the "Household Raw" dataset, the "Individual Raw" dataset, the "Household Member Raw" dataset, the "Fieldworker Questionnaire" dataset, the "Service Availability Raw" dataset, and the "Other Data" dataset.
We have chosen the 'Household Member Raw' dataset as our master dataset which we will merge all other datasets onto. We also had the option to use the 'Household Raw' data set but we opted for the member dataset as it was on the individual level and it made more logical sense to merge the other datasets onto it. To start the merging, we found four unique identifiers across the board which were, 'Line number of an individual', 'Household number', 'Cluster number', and 'Line number of individual questionnaire'. The first data set we merged onto the master dataset was 'Births Raw'. In this case, we created a new unique identifier in the master dataset that concatenates the cluster number, household number, and line number, this new variable was denoted as unique. We followed the same process in the births dataset to ease the process of merging. In the births dataset, some children were missing their unique member IDs in the master file because they did not live in the household. To include them, we gave each of them a separate unique ID. We then merged 1:1 using the births dataset on the newly generated Unique ID variable.
Next is the 'Childrens' dataset; we followed the same steps as we did in the previous merge where we created a Unique variable for the unique identifiers and also created new unique IDs for missing children in the original master file. We conducted a 1:1 merge using the 'Childrens' dataset.

Next up is the 'Household' dataset. Since this dataset was on the household level we only needed 'cluster number' and 'household number' to identify our data points. We generated a new variable that combined these two and conducted a many:1 merge using the 'Household' dataset. our reason for using many:1 was that the household dataset has a unique entry for each household whereas the master file had multiple entries for each household.

Next, we moved on to merging the 'Womens' dataset where we used the Unique variable we generated before that combined cluster number, household number, and member ID in the master file and created the same in the Women's dataset. We conducted a 1:1 merge using the 'Womens' dataset.

Moving onto the 'Verbal Autopsy' dataset we used the same Unique ID we used in the 'Womens' dataset and created the same in the 'Verbal Autopsy'. However, there were member IDs in the 'Verbal Autopsy' file that were not present in the master member file as they were deceased people. We created a separate unique member ID for them and then conducted a 1:1 merge using the 'Verbal Autopsy' file.

We can now move onto the final merge, which is using the 'Other Data' dataset. However, the members mentioned in this dataset are not the same as those in the master file. Hence, we first created new member IDs for them that were unique and distinct from those IDs in the master file. We generated the same Unique ID for 'Other Data' as we did in 'Verbal Autopsy' and conducted a 1:1 merge using 'Other Data'. All the required merging has been completed upto this point and we will now move onto cleaning the data.

Data cleaning:

A crucial point of working with any form of Data is that of cleaning it. Fortunately for our dataset, it was cleaned to a large extent. However, we did amend it to suit our needs better, and limit it within the scope of our research question. With the initial masterful providing us with 1292 variables, we limited them to 65 variables and generated 56 new variables. We recognize it may come across as a limitation of our analysis, however, this was done intentionally to stay within the bounds of the research question and guidelines set forth.

The first stage of data cleaning, after merging, was to Rename the variables that we needed. We created 4 categories for this; 1) Pregnancy Related Problems (26 variables), 2) Labour Problems

(11 variables), 3) Problems Suffered Before Pregnancy (14 variables), and lastly, 4) Other Variables (9 variables). With each totaling to 60 renamed variables.

Next, we labeled the variables as per the research question. Here we labeled 65 variables cumulatively. The categories being; 1) Antenatal Care Received, 2) Motor Vehicle Ownership, 3) Visit to Health Facility in Last 12 Months, 4) Residence Type, 5) Education Level, and the other 60 variables that were renamed were related to Pregnancy, Labor, and Problems Before Pregnancy.

Lastly, our cleaning ended with generating new variables. These were important to do, as without them we could not proceed further. Either some needed to be combined, or some needed to be brought back, or simply because we decided an "umbrella" variable would be more efficient. Therefore, we generated 28 new variables for Problems During Pregnancy, 11 for Problems During Labour, and 14 for Problems Suffered Before the Pregnancy. Lastly, we also generated 3 new variables for Row Total.

DATA QUALITY

Our research was based upon the data that we acquired from The Demographic and Health Surveys, and therefore we are assured that the data is of exceptional quality. There were 1292 variables, which covered a variety of factors. This was great aid in our research because we could carefully select the ones appropriate for our research question. Some variables were named appropriately, but most of them needed renaming with very few needing to be labeled again. This allowed for efficiency in our data analysis.

However, as with any dataset, there were some issues with this one too. For example, it did not account for genetics. Meaning, that the mother had genetic conditions which could have caused her health issues. This would have been useful because it would have allowed us to delineate the variables that were as a result of genetics and have a more nuanced analysis of the research. Right now, our research paper has this limitation. Furthermore, it did not account for the exact monthly incomes of the families, as that would have alluded to the relationship with visits to healthcare facilities. Moreover, it did not account for the service workers providing the health care, as in, their experience in the OBGYN field. This would have allowed for a more in-depth

study and we would have recognized trends better if the variables in the data were more partitioned and clear.

DESCRIPTIVE STATISTICS

```
. tabstat total_problems, by(antenatal_care_recieved) stats(mean median sd n)

Summary for variables: total_problems
Group variable: antenatal_care_recieved (Antenatal Care Received)
```

antenatal_care_recieved	Mean	p50	SD	N
yes	29.9886	31	4.854556	5791
no	32.35479	33	4.312447	637
Total	30.22309	31	4.855018	6428

Figure 1.1: Summary of variables

```
.
. tabstat before_problems, by(antenatal_care_recieved) stats(mean median sd n)

Summary for variables: before_problems
Group variable: antenatal_care_recieved (Antenatal Care Received)
```

antenatal_care_recieved	Mean	p50	SD	N
yes	.5263577	0	.8433715	6279
no	.3988636	0	.7397374	880

Figure 1.2 Summary of variables

```
. tab before_problems
```

Problems Suffered Before Pregnancy	Freq.	Percent	Cum.
0	4,674	65.29	65.29
1	1,636	22.85	88.14
2	605	8.45	96.59
3	179	2.50	99.09
4	53	0.74	99.83
5	11	0.15	99.99
6	1	0.01	100.00
Total	7,159	100.00	

FIGURE 1.3

```
. summarize total_problems preg_problems labor_problems before_problems, detail
```

Pregnancy Experience

	Percentiles	Smallest		
1%	17	3		
5%	21	6		
10%	23	6	Obs	6,428
25%	27	6	Sum of wgt.	6,428
50%	31		Mean	30.22309
		Largest	Std. dev.	4.855018
75%	34	37		
90%	36	37	Variance	23.5712
95%	37	37	Skewness	-.9048369
99%	37	37	Kurtosis	3.895492

Problems During Pregnancy

	Percentiles	Smallest		
1%	8	0		
5%	12	2		
10%	14	2	Obs	7,187
25%	17	2	Sum of wgt.	7,187
50%	21		Mean	20.04592
		Largest	Std. dev.	4.320368
75%	23	26		
90%	25	26	Variance	18.66558
95%	26	26	Skewness	-.74687
99%	26	26	Kurtosis	3.151787

Problems During Labor

	Percentiles	Smallest		
1%	5	0		
5%	8	0		
10%	9	0	Obs	6,428
25%	10	0	Sum of wgt.	6,428
50%	11		Mean	10.26976
		Largest	Std. dev.	1.369625
75%	11	11		
90%	11	11	Variance	1.875874
95%	11	11	Skewness	-3.73751
99%	11	11	Kurtosis	23.36596

Problems Suffered Before Pregnancy

	Percentiles	Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	7,159
25%	0	0	Sum of wgt.	7,159
50%	0		Mean	.5106858
		Largest	Std. dev.	.8323352
75%	1	5		
90%	2	5	Variance	.6927819
95%	2	5	Skewness	1.875638
99%	3	6	Kurtosis	6.839681

FIGURE 1.4

```
. tab total_problems
```

Pregnancy Experience	Freq.	Percent	Cum.
3	1	0.02	0.02
6	3	0.05	0.06
7	1	0.02	0.08
9	3	0.05	0.12
10	3	0.05	0.17
11	6	0.09	0.26
13	6	0.09	0.36
14	9	0.14	0.50
15	15	0.23	0.73
16	14	0.22	0.95
17	31	0.48	1.43
18	44	0.68	2.12
19	55	0.86	2.97
20	73	1.14	4.11
21	87	1.35	5.46
22	151	2.35	7.81
23	154	2.40	10.21
24	180	2.80	13.01
25	227	3.53	16.54
26	261	4.06	20.60
27	341	5.30	25.90
28	358	5.57	31.47
29	446	6.94	38.41
30	459	7.14	45.55
31	538	8.37	53.92
32	527	8.20	62.12
33	556	8.65	70.77
34	558	8.68	79.45
35	554	8.62	88.07
36	392	6.10	94.17
37	375	5.83	100.00
Total	6,428	100.00	

```
. summarize total_problems preg_problems labor_problems before_problems, detail
```

FIGURE 1.5

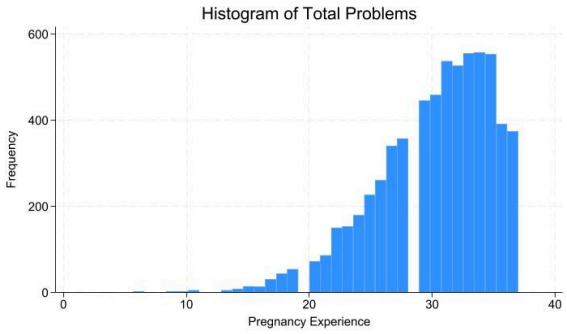

Fig 2.1: HISTOGRAM

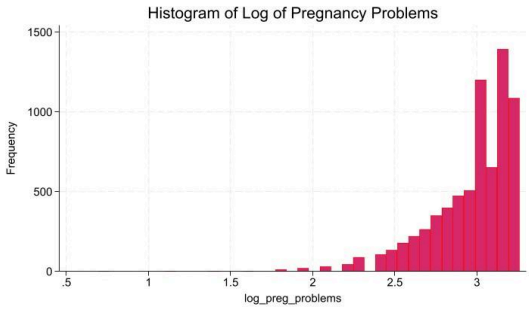

Fig 2.2: HISTOGRAM

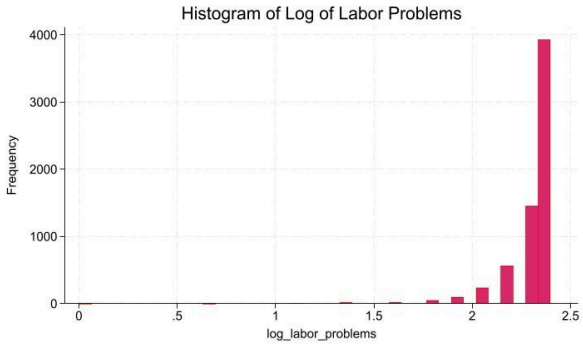

Fig 2.3: HISTOGRAM

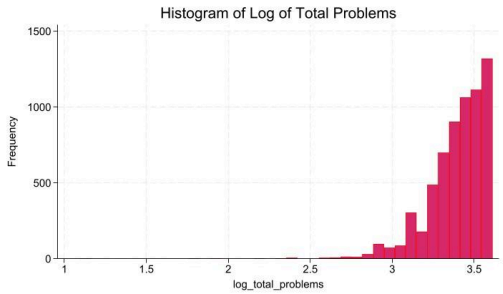

Fig 2.4: HISTOGRAM

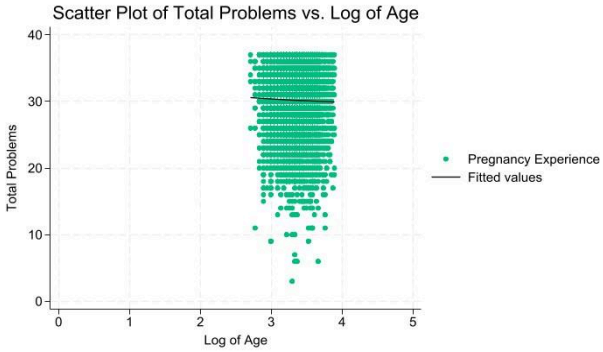

Fig 3.1: SCATTER PLOT

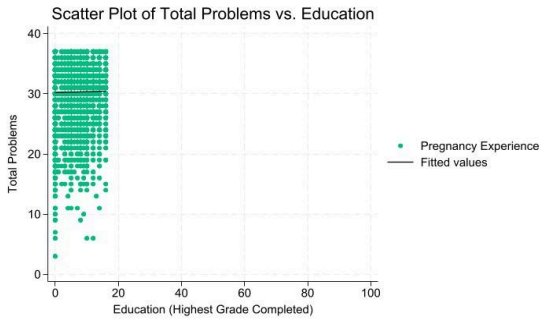

Fig 3.2: SCATTER PLOT

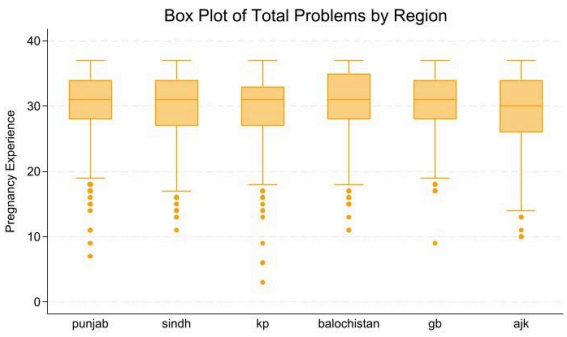

Fig 4.1: BOX PLOT

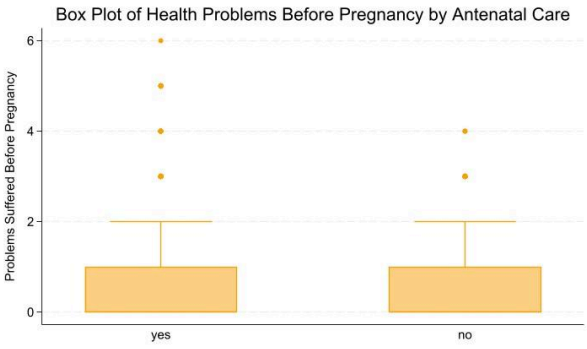

Fig 4.2: BOX PLOT

After curating and cleaning our data, the next step was to visualize this data for ease of presenting and efficiency in analyzing it. The command used were [graph *variable name*], and from there we generated 8 graphs; 4 histograms, 2 scatter plots and 2 boxplots.

The histogram for Total Problems against the pregnancy experience in Figure 2.1 shows how the mother's experience was better as the total problems increased, and the experience was relatively unpleasant as the problems decreased. The rational explanation for this could be that when the mother's total problems increase, they visit healthcare facilities more so as to protect the fetus. Their visits eventually lead to assurance from practitioners, increased healthcare or awareness, and overall ease of anxiety.

From fig 2.2, we discovered that the problems during pregnancy were graphically rightly skewed, with the overall shape of the curve being "bell-shaped", and their frequency went was forming a bell shaped curve. The findings show us that there were a total of 26 problems, and it corroborated with our final regression output which revealed a negative correlation between pregnancy problems and the experience, meaning the more health issues the expectant mother had, the better her experience was.

Figure 2.3 revealed quite shocking findings. Either women experienced no problems, or they experienced around 11 problems during labor (further proven in fig. 1.6) with a frequency of almost 3900. These are troublesome, but with an analytical perspective, quite in line. The higher number of labor problems shown show the poor healthcare system of Pakistan with issues such as electricity, insensitive nature of nurses, lack of epidural, etc, and these results also hint at the high MMR.

The scatter plot in figure 3.1, showing data points in green and a line representing fitted values, illustrates the link between the total number of issues and the logarithm of age. The majority of data points cluster between log values of 1 and 2.5, indicating a rise in log age issues up to a stabilizing log age of 2.5. At lower log ages, the fitted line exhibits a linear trend; but, at larger values, it flattens, indicating a non-linear connection. This scatterplot is especially important considering it helps us in understanding how pregnancy problems evolve with age, and is made easier with the use of this analysis, which is important for maternity care planning.

The scatterplot 3.2 reveals a negative correlation between the variables "Total Problems" and "Education" (highest grade finished), meaning that the overall number of reported difficulties

declines as education levels rise. The fitted line indicates a somewhat significant linear association, highlighting the importance of education when determining the likelihood of problems. The data stopping at before 20 for Education shows in a quantified manner about the low levels of education obtained by a Pakistani woman. This is troublesome as with lower education, there are more problems with pregnancies. Furthermore, the validity of the data is also called into question with scatterplot 3.2, because realistically, gaining 50+ years of education is impossible (even for doctors).

This box plot in fig. 4.1 shows the distribution of total problems for all the regions of the data set. The median is quite similar across all regions. KP, Punjab, and Sindh have the longest whiskers which implies more variance in the lower range of the data whereas GB and Balochistan have more variance in the upper range of the data due to their shorter whiskers. Punjab and KP both have a high number of outliers which means there were a large number of unusually large or small reports in pregnancy problems. This graph gives us a good idea of how pregnancy experience differed from region to region.

Figure 4.2 is a box plot of health problems before pregnancy by antenatal care. between groups of yes and no, the median number of pregnancy problems is low and approximately the same. There are more outliers in the "yes" group than in the "no" group however the data suggests that women receiving antenatal care report slightly fewer problems. The boxplot shows differences between mothers who received antenatal care versus those who did not.

REGRESSION DIAGNOSTICS

As we have established, we are trying to determine the impact of the mother's health before pregnancy on the pregnancy experience. Once we ran our final regression determining this impact, we tested for multiple errors in the variables. We started by testing for multicollinearity. The first step in this was running a correlation command of all the variables except the dependent variable. that command was as follows; [corr before_problems log_hh_member_age region motorvehicle martial_status antenatal_care_recieved visit_healthfacility_12_months education residence_type]. This test showed that none of the values were greater than 0.5 therefore no multicollinearity. We then ran an auxiliary regression which was a regression of all the variables in the correlation command above. This showed that the auxiliary regression had a lower

R-squared value than the original regression. This was further proof of no multicollinearity. We finally ran the original regression and then a VIF test. The VIF test showed a value of 1.07 which meets the requirements of not being over 5. Therefore we concluded that there is no multicollinearity present in the X variables.

We then moved on to testing for heteroscedasticity. We first run the original regression, the command [rvfplot, yline(0)] follows it which plots residual values against fitted values and runs a line of best fit through it in the form of a graph. This showed scattering points as move right which is evidence of heteroscedasticity. We then ran the [estat hettest] command which gave us a Prob > chi2 = 0.0000, which indicates heteroscedasticity. We ran the original regression once more with a vce(robust) command at the end of it. This solved the heteroscedasticity present. When it comes to autocorrelation, We concluded that it was not possible as we were working with cross-sectional data.

After this we tested for something we suspected the data to have as our results were opposite to intuition. We tested for Omitted Variable bias with the command [ovtest]. Our results showed that Omitted Variable Bias was present with a Prob > F = 0.0026.

RESULTS

Before we delve into the regressions we carried out, it is important to establish two significant points about our data. The first is that the final variable "total_problems" which defines the pregnancy experience was initially divided into two separate variables, "before_problems" and "labor_problems". These variables defined the pregnancy experience during labor and pre-labor. The second key detail is that the pregnancy experience was defined with negative experience variables which means that if its value decreases in our regressions, it implies that the pregnancy experience is more positive for the mother. Initially we ran two regressions, one regression was to see the impact of the mothers pre pregnancy health on problems experienced solely during labor, and the other was to see the impact of the mothers pre pregnancy health on problems experienced solely pre-labor during pregnancy. Running separate regressions helped us validate

our final model and make sure there were no polarizing differences in the impact on both of these variables before combining them.

The first regression is as follows:
reg log_labor_problems before_problems log_hh_member_age region motorvehicle martial_status antenatal_care_recieved visit_healthfacility_12_months education residence_type

Source	SS	df	MS	Number of obs	=	6,365
				F(9, 6355)	=	50.22
Model	7.57033348	9	.841148164	Prob > F	=	0.0000
Residual	106.434386	6,355	.016748133	R-squared	=	0.0664
				Adj R-squared	=	0.0651
Total	114.00472	6,364	.017914004	Root MSE	=	.12941

log_labor_problems	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
before_problems	-.0383612	.0020077	-19.11	0.000	-.0422969	-.0344255
log_hh_member_age	.0295986	.0074346	3.98	0.000	.0150243	.0441729
region	-.0024327	.0010084	-2.41	0.016	-.0044095	-.0004558
motorvehicle	-.0110747	.0052422	-2.11	0.035	-.0213512	-.0007982
martial_status	-.0051789	.0106481	-0.49	0.627	-.0260528	.015695
antenatal_care_recieved	.0191112	.0057949	3.30	0.001	.0077513	.0304711
visit_healthfacility_12_months	.0036016	.0055286	0.65	0.515	-.0072363	.0144394
education	-.0018541	.000336	-5.52	0.000	-.0025128	-.0011953
residence_type	.0015397	.0034213	0.45	0.653	-.0051671	.0082465
_cons	2.261734	.0299573	75.50	0.000	2.203007	2.32046

The output of this regression shows us that the "before_problems" variable i.e. the health problems pre-pregnancy are statistically significant and have a negative correlation with labor problems, which implies that for every 1 unit increase in pre pregnancy health problems the labor_problems value will decrease by approximately 3.84%. This essentially means that the more health problems a mother has the better her labor experience will be.

The second regression is as follows: reg log_preg_problems before_problems log_hh_member_age region motorvehicle martial_status antenatal_care_recieved visit_healthfacility_12_months education residence_type

Source	SS	df	MS		
Model	113.970651	9	12.6634056	Number of obs	= 7,158
Residual	351.680421	7,148	.049199835	F(9, 7148)	= 257.39
				Prob > F	= 0.0000
Total	465.651072	7,157	.065062327	R-squared	= 0.2448
				Adj R-squared	= 0.2438
				Root MSE	= .22181

log_preg_problems	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
before_problems	-.1415177	.0031787	-44.52	0.000	-.147749	-.1352864
log_hh_member_age	-.0003291	.0118675	-0.03	0.978	-.023593	.0229348
region	-.002852	.0016179	-1.76	0.078	-.0060236	.0003196
motorvehicle	-.0196429	.008534	-2.30	0.021	-.0363721	-.0029136
martial_status	-.0243373	.0178886	-1.36	0.174	-.0594041	.0107296
antenatal_care_recieved	.0963337	.0083671	11.51	0.000	.0799316	.1127357
visit_healthfacility_12_months	.0385187	.0088366	4.36	0.000	.0211963	.055841
education	.0031329	.0005395	5.81	0.000	.0020753	.0041905
residence_type	-.0082156	.0055027	-1.49	0.135	-.0190026	.0025714
_cons	2.9618	.0484473	61.13	0.000	2.866829	3.056771

The output of this regression is similar to the previous one in almost every way except for the value of the coefficient. In this case, for every 1 unit increase in pre-pregnancy health problems the "before_problems" value will decrease by approximately 14.2%. We can see that the difference in impact between these two regressions is quite significant and that pre-labor pregnancy problems will have a higher weightage on the results compared to labor problems.

Next, we ran the third regression which combined both initial variables to give us a "total_problems" variable which signified all the pregnancy problems. this regression was as follows:

reg log_total_problems before_problems log_hh_member_age region motor vehicle martial_status antenatal_care_recieved visit_healthfacility_12_months education residence_type

Source	SS	df	MS	Number of obs	=	6,403
				F(9, 6393)	=	234.11
Model	54.1765295	9	6.01961439	Prob > F	=	0.0000
Residual	164.379453	6,393	.025712413	R-squared	=	0.2479
				Adj R-squared	=	0.2468
Total	218.555983	6,402	.034138704	Root MSE	=	.16035

log_total_problems	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
before_problems	-.1067669	.0024777	-43.09	0.000	-.111624	-.1019098
log_hh_member_age	.0156706	.0091731	1.71	0.088	-.0023117	.0336529
region	-.0028556	.001247	-2.29	0.022	-.0053001	-.000411
motorvehicle	-.0147378	.0064715	-2.28	0.023	-.0274241	-.0020516
martial_status	-.0144327	.0131932	-1.09	0.274	-.0402957	.0114304
antenatal_care_recieved	.06062	.0071608	8.47	0.000	.0465825	.0746575
visit_healthfacility_12_months	.0272345	.0068253	3.99	0.000	.0138547	.0406144
education	.001126	.0004152	2.71	0.007	.0003121	.0019399
residence_type	-.0001867	.0042257	-0.04	0.965	-.0084706	.0080971
_cons	3.34351	.0369844	90.40	0.000	3.271008	3.416012

The regression output above shows us that "before_problems" has a negative correlation with "total_problems". For every 1 unit increase in "before_problems" the "total_problems" value will decrease by approximately 10.7%. following suit of the initial regressions we carried out. After correcting for Heteroskedasticity, we ran the final regression for our research question from which we will conclude our results, it is as follows:

reg log_total_problems before_problems log_hh_member_age i.region i.motorvehicle i.martial_status i.antenatal_care_recieved i.visit_healthfacility_12_months education i.residence_type

```
. reg log_total_problems before_problems log_hh_member_age i.region i.motorvehicle i.martial_status i.antenatal_care_recieved i.visit_healthfacility_12_months education i.resi
> dence_type
```

Source	SS	df	MS	Number of obs	=	6,403
				F(14, 6388)	=	151.92
Model	54.5904957	14	3.89932112	Prob > F	=	0.0000
Residual	163.965487	6,388	.025667734	R-squared	=	0.2498
				Adj R-squared	=	0.2481
Total	218.555983	6,402	.034138704	Root MSE	=	.16021

log_total_problems	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
before_problems	-.1070462	.0024875	-43.03	0.000	-.1119225	-.1021699
log_hh_member_age	.0159237	.009197	1.73	0.083	-.0021055	.0339529
region						
sindh	-.0229613	.0061364	-3.74	0.000	-.0349907	-.0109319
kp	-.0088736	.0059865	-1.48	0.138	-.0206092	.0028619
balochistan	-.0127499	.0070397	-1.81	0.070	-.0265501	.0010503
gb	-.0059619	.0078104	-0.76	0.445	-.0212729	.0093491
ajk	-.0256849	.0074804	-3.43	0.001	-.0403491	-.0110208
motorvehicle						
no	-.0128946	.0065035	-1.98	0.047	-.0256436	-.0001455
martial_status						
divorced/separated	-.0001153	.0321862	-0.00	0.997	-.0632111	.0629806
widowed	-.0356595	.0288708	-1.24	0.217	-.092256	.0209369
antenatal_care_recieved						
no	.060167	.0072775	8.27	0.000	.0459006	.0744333
visit_healthfacility_12_months						
no	.0266539	.0068468	3.89	0.000	.0132319	.040076
education	.0009717	.0004401	2.21	0.027	.0001091	.0018344
residence_type						
rural	-.0010597	.0042771	-0.25	0.804	-.0094443	.007325
_cons	3.403858	.0318102	107.01	0.000	3.3415	3.466217

From this output, we can see that almost nothing has changed when it comes to the impact of "before_problems" on "total_problems". For every one-unit increase in "before_problems" the value of "total_problems" decreases by approximately 10.7%. This means that for every one-unit increase in pre-pregnancy health problems, the total pregnancy experience increases by 10.7% for the mother.

At first glance these results seem very odd, how can worse health mean a more positive pregnancy experience? One possible reason for this result could have to do with the utilization of healthcare. If mothers are experiencing more health problems before pregnancy they may be more likely to seek out and utilize health care services, especially if they are planning their pregnancy. By actively seeking out and using these healthcare facilities they could mitigate many complications that would have arisen with their pregnancy. The variable "antenatal_care_recieved" gives us meaningful insight into this theory. The regression output shows us that "antenantal_care_recieved" is highly statistically significant and its coefficient value prompts that not receiving antenatal care has a positive correlation with the total problems. Women with more pre-pregnancy problems received more care which might have led to a much better pregnancy experience in comparison.

Another reason for our results could just be a reporting bias. Women who have more health problems before pregnancy might be more health conscious and vigilant and might report

problems that others would not. seeking more care also means more knowledge when it comes to seeking out problems that might have a greater impact later. more problems might lead to more motivation to be healthier. Considering everything, it is clear that our regression model is suffering from Omitted Variable Bias as the testing in our inferentials confirmed the same. If we categorize the justifications for the results into variables that were omitted then having variables such as access to healthcare, monitoring levels and intervention, and health vigilance in the data and thus our model would solve this issue.

Overall, the idea that access and utilization of health care has a very strong correlation with the pregnancy experience seems to be a sound one, especially considering the country of Pakistan where healthcare is not available to everyone so even when it is, people believe they do not need it for themselves or the people around them.

CONCLUSION

This research paper highlights that in Pakistan, women with pre-existing health issues are more likely to receive thorough care due to greater healthcare engagement. It exposes significant healthcare access disparities across socioeconomic groups and stresses the urgent need for reform in maternity care practices. Furthermore, enhanced prenatal care access and reducing disparities are crucial for improving maternal health outcomes. Policymakers must prioritize equitable healthcare access and safeguarding women during childbirth to effectively lower maternal morbidity and mortality rates.

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