

Socioeconomic Analysis of Proper Time and Source of Prenatal-Care: A Case Study of Pakistan

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Abstract: The paper attempted to examine the socioeconomic determinants of proper time and source of prenatal-consultation as the components of prenatal-care utilization by the women in age group of 15-49 years. Micro-data comprising 13594 observations from Pakistan Integrated Household Survey 2001 has been utilized. A series of models have been created to estimate the proper time of first consultation and source of consultation through binary logistic regression. The explanatory variables are categorized into individual characteristics, household characteristics and community characteristics. The results explained that woman's age and education and urban locality of the household positively impact the proper time (within first trimester) for first consultation and public sector source of consultation. Birth-order of the child negatively affects the proper time for consultation. The number of children and provision of electricity in the household negatively affect both of the components of prenatal-care utilization. The provision of safe-drinking water that is a component of health-care practice positively influences the public sector source of consultation. An important result is that the women from Balochistan are less likely to take prenatal consultation in proper time. Similarly, the women from Punjab and Sindh are more likely to have public sector source of prenatal-consultation.

JEL Classification: I10 · J13 · I18 · O18

Key words: Women health · Rural-urban disparity · Balochistan · Maternal health-care · Household economics · Woman education

INTRODUCTION

Prenatal-care is an important indicator of maternal health status. It is significant for mothers and newborns to avoid health complications. According to health standards, initiation of prenatal-care should be in first trimester of pregnancy to avoid pregnancy complications [1]. Prenatal-care is more likely to be effective if women begin to receive care in the first trimester of pregnancy and continue to receive it throughout the pregnancy. The lack of prenatal-care is associated with many complications like premature delivery, infant and maternal mortality [2,3]. The low quality of prenatal-care also has implications after delivery. For instance, delivery assisted by non-professionals, few prenatal-care checks and less post-natal home visits by a public health midwife result in poor acceptable diet by child during breastfeeding. Fewer prenatal visits also delay the introduction of complementary food for child in infancy. Similarly fewer

prenatal visits and lack of postnatal check ups are determinants of poor dietary diversity of child [4]. Heaman, *et al.* concluded that likelihood of preterm birth and low birth-weight increases by 22 and 40 percent by inadequate and no prenatal-care respectively [2]. Worldwide more than half of the women die annually due to pregnancy related complications. About 90-95 percent of them come from developing countries. In Pakistan the women receiving the prenatal-care is 61 percent (against 95 percent in Indonesia, 95 percent in Turkey and 75 percent in India), while the maternal mortality rate is 260 per 100,000 live births against 220, 20 and 200 per 100,000 live births in Indonesia, Turkey and India respectively.

In this background, we focus on a low-income economy, i.e. Pakistan, to see the determinants of prenatal-care utilization in terms of proper time for first consultation and public/private source of prenatal consultation.

Review of Literature: In the literature varying components of prenatal-care utilization have been analyzed. Researchers have focused on multiple individual, household, socioeconomic, demographic, environmental and pregnancy-related factors associated with the utilization of prenatal-care. The individual characteristics like age, education, income, employment, living with child's father (proxy of family support), attempted abortions (proxy of maternal attitudes) and satisfied with pregnancy [2], socio-economic variables such as household assets, owning a modern transport, husband's education and occupation, wealth index, health insurance, receiving welfare benefits [5], community variables like the presence of electricity and quality of home affects the probability of prenatal-care utilization. Similarly, regional attributes like rural-urban settings [6] and regional place of living emerged as imperative determinants of prenatal-care utilization [7]. The ethnic and religious variables like European and non-European in Belgium [5] and Protestantism or catholic in Haiti [6] have also been found significant factors of prenatal-care utilization. On the supply side the long waiting time at clinics has been emerged as a significant determinant of prenatal-care utilization [8] along with insufficient supply of medicine and vaccination [9].

The researchers categorized the levels of prenatal-care utilization in terms of under-utilization and inadequate utilization. Bassani, *et al.* [10] have adopted the Kessner Index [11] for adequacy of prenatal-care. Titley, *et al.* defined the under-utilization of prenatal-care as never attended prenatal-care service or less than four recommended prenatal-care services [3]. Mikhail [8] calculated the inadequate utilization of prenatal-care by Kotelchuck's Index.

Some of the studies have not used the term inadequacy or under-utilization of prenatal-care but analyzed the utilization of prenatal-care services in other ways. For instance, Beeckman, *et al.* analyzed total number of prenatal visits by woman [1]. Cross, *et al.* assessed the timing of first prenatal visit by adult and adolescent pregnant woman [12]. Beeckman, *et al.* have probed the late initiation of prenatal-care, i.e. first visit after 12 weeks of gestation [5]. For Pakistan, Nisar and White estimated the utilization of prenatal-care by taking it as the prenatal service received during last pregnancy once by doctor, nurse, lady health visitor, midwife or *Dai* (traditional birth attendant) [9]. Fatimi and Avan (for Pakistan) [13] and Mumtaz and Salway (for Pakistan) [14] have also used the same conceptualization. Agha and

Carton (for Pakistan) have taken the utilization of prenatal-care as at least three prenatal-care visits by the woman [15].

Fatimi and Avan probed the determinants of prenatal-care in rural areas of Pakistan by primary data. A variety of explanatory variables were included in the analysis. For instance, woman's education, husband's education, ethnic origin, woman's work status, family type, husband's job, household income, electricity in the household, electronic media, home appliances, own cattle, own transport, construction of house, type of latrine and husband's white collar job were the explanatory variables. The results were obtained through odd ratios. Husband's education, white collar job, living in *pucca* (cemented) house, flush latrine in the household, provision of electricity in the household were found positively influencing the prenatal-care utilization while own cattle and own transport cattle were found negatively affecting the prenatal-care utilization [13].

We will focus on two components of prenatal-care utilization mentioned above by using micro-data. Using the micro-data in Anderson and Newman's framework [16] will be the uniqueness of the study for Pakistan.

MATERIALS AND METHODS

Data Set: For estimating the determinants of prenatal-care utilization, the micro-data has been taken from Pakistan Integrated Household Survey 2001 (PIHS) by Federal Bureau of Statistics, Pakistan. The PIHS is a demographic, socio-economic and health survey program devising data on family planning, reproductive health, maternal and child health, nutrition, immunization, education and employment.

Proper Time of First Consultation and Public/Private Source of Prenatal-Care: The analysis is composed of two questions, firstly, whether the first consultation by the woman has been taken in the first trimester or later; and secondly, whether the woman has utilized the public/private source of consultation or otherwise.

Selection of Explanatory Variables: Grossman first introduced the conception that demand for medical-care is derived from the demand for good health [18]. The determinants of medical-care in the case of prenatal-care in developing countries may be: women's socio-demographic characteristics, current pregnancy characteristics, household characteristics, regional characteristics and community characteristics, etc. [7].

Table 1: Operational Definitions of Variables

Variables	Definitions
Dependent Variables	
Model-1	
PTCON (Proper Time of Consultation)	If the woman has received consultation in first trimester = 1, otherwise = 0
Model-2	
SOUR (Source of Consultation)	If the woman has taken consultation from government hospital =1, otherwise = 0
Explanatory variables	
Individual Characteristics	
AGE (Age)	Age of the woman in completed year
AGESQ (Square of the age)	Square of the age of woman
EDU (Education)	Education of the woman in completed years
BORD (Birth-order)	Birth-order of the child of last pregnancy
DYCHILD (Died children)	Number of died children of the woman
MISCAR (Miscarriages)	Number of miscarriages to the woman
Household Characteristics	
ELECT (Electricity)	If the household has the electricity = 1, otherwise = 0
GAS (Gas)	If the household has the gas = 1, otherwise = 0
SEWR (Sewerage)	If the household has the sewerage = 1, otherwise = 0
NROOM (Number of room)	Number of the room in the household
SDW (Safe drinking water)	If the household has the safe drinking water = 1, otherwise = 0
Regional Characteristics	
REG (Region)	If the household is urban =1, otherwise (rural) = 0
PUN (Punjab)	If the household is situated in Punjab = 1, otherwise = 0
KPK (Khyber Pakhtunkhwa)	If the household is situated in Khyber Pakhtunkhwa = 1, otherwise = 0
BAL (Balochistan)	If the household is situated in Balochistan = 1, otherwise = 0
SIND (Sind)	If the household is situated in Sind = 1, otherwise = 0

Andersen and Newman developed the behavioral model for utilization of health-care. The model gives the conceptual framework for determinants of health-care. The components of health-care (in the case of prenatal-care) are external environment, predisposing factors, enabling factors and need factors [16]. We have selected the variables from PIHS, which are partially covering the framework given by Andersen and Newman [16].

Model Specification: We have included two components of prenatal-care utilization. For the purpose we have developed a series of models. The multivariate analysis is done for each model. For both models binary logit regression has been applied. Each model has a set of explanatory variables. These variables are classified into three categories, so the general function of the prenatal-care utilization is given as:

Prenatal-care utilization = f (individual characteristics, household characteristics, regional characteristics)

The Models Are Expressed as Below:

$$PTCON = f \left(\begin{array}{l} \mu_0 + \mu_1 AGE + \mu_2 AGESQ + \mu_3 EDU + \mu_4 BORD \\ + \mu_5 DYCHILD + \mu_6 MISCAR + \mu_7 ELECT + \mu_8 GAS + \\ \mu_9 SEWR + \mu_{10} NROOM + \mu_{11} SDW + \mu_{12} REG \\ + \mu_{13} PUN + \mu_{14} KPK + \mu_{15} BAL + \mu_{16} SIND \end{array} \right) \quad (1)$$

$$SOUR = f \left(\begin{array}{l} \Omega_0 + \Omega_1 AGE + \Omega_2 AGESQ + \Omega_3 EDU + \Omega_4 BORD + \\ \Omega_5 DYCHILD + \Omega_6 MISCAR + \Omega_7 ELECT + \Omega_8 GAS + \\ \Omega_9 SEWR + \Omega_{10} NROOM + \Omega_{11} SDW + \Omega_{12} REG + \\ \Omega_{13} PUN + \Omega_{14} KPK + \Omega_{15} BAL + \Omega_{16} SIND \end{array} \right) \quad (2)$$

The operational definitions of the variables have been given in Table 1.

Econometric Estimates

Results of Model 1 (Proper Time of First Consultation): The results of logistic regression regarding proper time of first consultation, i.e. whether the first consultation was taken at appropriate time (first trimester) or not¹, are shown in Table 2.

Results of the Model 2 (Source of Prenatal-Care): The results of public/private source of consultation are shown in Table 3.

DISCUSSION

The analysis in the current study helps us to identify determinants of prenatal consultation at proper time and public sector source of consultation.

In the individual characteristics, age of the woman is significant in both models. It positively influenced the

¹A number of studies [2,5,10] have taken it as the adequacy/inadequacy of prenatal-care utilization.

Table 2: Results of Model 1 (Multivariate Logit Analysis of Proper time of First Consultation)

Dependent Variable: PTCO				
Method: ML - Binary Logit (Quadratic hill climbing)				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
AGE	0.213478	0.079869	2.672865	0.0075*
AGESQ	-0.003053	0.001136	-2.686916	0.0072*
EDU	0.039800	0.016875	2.358462	0.0184*
BORD	-0.021676	0.041151	-1.192675	0.0584**
DYCHILD	-0.199286	0.151353	-2.196680	0.0391*
MISCAR	0.027984	0.075090	0.372673	0.7094
ELECT	0.865761	0.255207	3.392391	0.0007*
GAS	-0.188718	0.172281	-1.095408	0.2733
SEWR	0.249172	0.173735	1.934213	0.0515**
NROOM	0.005791	0.042048	0.137716	0.8905
SDW	0.051455	0.211258	0.243566	0.8076
REG	0.486392	0.189144	2.571545	0.0101*
PUN	-0.335310	0.270474	-1.239711	0.2151
KPK	-0.088154	0.272977	-0.322934	0.7467
BAL	-0.842639	0.353075	-2.386571	0.0170*
SIND	-0.420259	0.280738	-1.496984	0.1344
C	-6.519910	1.413368	-4.613031	0.0000*
McFadden R-squared = 0.046264		Mean dependent var = 0.089538		
S.D. dependent var = 0.285564		S.E. of regression = 0.282441		
Akaike info criterion = 0.586981		Sum squared resid = 252.4011		
Schwarz criterion = 0.623187		Log likelihood = -915.1795		
Hannan-Quinn criter. = 0.599965		Deviance = 1830.359		
Restr. Deviance = 1919.145		Restr. log likelihood = -959.5727		
LR statistic = 88.78639		Avg. log likelihood = -0.287521		
Prob (LR statistic) = 0.000000		Total obs = 3183		
Obs (with Dep=0) = 2898		Obs (with Dep=1) = 285		

* represents 5 percent level of significance and ** represents 10 percent level of significance

Table 3: Result of Model 2 (Multivariate Logit Analysis for Source of Consultation)

Dependent Variable: SOUR				
Method: ML - Binary Logit (Quadratic hill climbing)				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
AGE	0.039425	0.064945	2.607062	0.0543**
AGESQ	-0.000365	0.000921	-0.396034	0.6921
EDU	0.018201	0.014836	3.226807	0.0199*
BORD	0.023867	0.036062	0.661844	0.5081
DYCHILD	0.077873	0.138512	0.562211	0.5740
MISCAR	0.002013	0.067350	0.029894	0.9762
ELECT	0.640202	0.215181	2.975174	0.0029*
GAS	0.230581	0.153438	1.502761	0.1329
SEWR	0.116645	0.148854	0.783620	0.4333
NROOM	0.314507	0.455247	2.843183	0.0583**
SDW	0.516116	0.227293	2.270710	0.0232*
REG	0.528304	0.161921	3.262726	0.0011*
PUN	0.616271	0.322072	1.913458	0.0557**
KPK	0.236240	0.344356	0.686034	0.4927
BAL	0.350242	0.366640	0.955273	0.3394
SIND	0.937232	0.322411	2.906945	0.0036*
C	-5.026921	1.179188	-4.263036	0.0000*
McFadden R-squared = 0.066599		Mean dependent var = 0.120275		
S.D. dependent var = 0.325334		S.E. of regression = 0.318015		
Akaike info criterion = 0.696620		Sum squared resid = 322.0086		
Schwarz criterion = 0.728863		Log likelihood = -1097.941		
Hannan-Quinn criter. = 0.708180		Deviance = 2195.881		
Restr. Deviance = 2352.558		Restr. log likelihood = -1176.279		
LR statistic = 156.6772		Avg. log likelihood = -0.342999		
Obs (with Dep=0) = 2816		Obs (with Dep=1) = 385		

Total obs = 3201

* represents 5 percent level of significance and ** represents 10 percent level of significance

proper time of first consultation and public sector source of consultation. Positive association shows that as age of woman increases the likelihood of proper time of consultation and consultation from public sector source of consultation multiplies. Age is an important determinant of female health-seeking behavior in social perspectives. The explanation of positive association may be that as age of female increases, level of awareness boosts up, more information about health and health-care is gathered and awareness about consultation and health-care providers increases. It also causes to increase the awareness about quality of consultation. That is why older females are more likely to take prenatal-care at proper time as well as from public sector source as compared to younger ones. Prenatal-care is negatively associated with age square in second model showing that by increase in age, the proper time for first consultation first increases and then decreases.

Woman's education is an important determinant of prenatal-care utilization. In our results education of the woman as a continuous variable has positively influenced both components of prenatal-care utilization, i.e. proper time of first consultation and public sector source of consultation. The women with better education are more likely to receive first consultation at proper time (during first three months of pregnancy). The explanation may be that more educated women seek high quality services and have greater ability to use health-care inputs to maintain their health [1,3,5,7,9,10,17]. The education impacts individual's behavior regarding health. The educated women may take preventive health-care measures, as they have more control over their lives [6]. Education enhances the women decision making power and confidence. The educated women have a position in the household to take decisions regarding their own as well as of their children's health. Another explanation may be that education increases overall awareness including health and health-care utilization.

Birth-order of the child has shown significant result in first model. It negatively affects the proper time of first consultation. Such type of impact is supported by a number of studies. Women experiencing higher number of births have less likelihood of prenatal-care utilization [3,7,17]. The possible explanation may be that during their first pregnancy females are more vigilant so they attempt to seek prenatal-care at proper time. With the passage of time due to experience and confidence from previous pregnancies they feel less need of prenatal-care for subsequent pregnancies. Other explanation may be that

the number of births decreases the marginal propensity to have a child, consequently the mother receives less prenatal-care in the form of proper time for first consultation[18].

The provision of electricity in the household has been used as a proxy of social status of the household. It emerged significant in both models of prenatal-care utilization. The socioeconomic status of the household positively impacts the proper time for first consultation and public sector source of the prenatal-care. A number of studies have supported the positive impact of electricity on prenatal-care utilization [3,13,17].

Provision of safe drinking water in the household has been used as an explanatory variable for prenatal-care utilization. It is also an input of health-care. The public sector source of prenatal consultation is positively related with provision of safe drinking water in the household. It means that safe drinking water and public sector source of prenatal consultation are complements to each other. The number of rooms in the household is another proxy of socioeconomic status of the household. The public sector source of prenatal consultation is found positively associated with this variable. The variables representing the socio-economic status of household have shown positive impact on both components of prenatal-care utilization. The socioeconomic status of the household is a requisite for prenatal-care utilization that is woman or the household should have accessibility to the prenatal-care service. It also explains the cost aspect of prenatal-care utilization[19].

In our analysis, rural urban locality of the household has emerged as one of the determinants showing significant results for both components of parental-care utilization, i.e. proper time of first consultation and public sector source of prenatal consultation. The rural urban disparity is distinguished characteristic of developing economies. In our study living in urban areas has a positive effect on proper time of first consultation and public sector source of consultation. The result is supported by a number of studies in developing countries [3,6,7,8,17]. The obvious explanation may be that there is lack of health-care infrastructure in rural settings, which decreases the likelihood of prenatal consultation at proper time. The transportation cost and traveling time also matter for the rural population. Moreover the income of the rural households is lower as compared to their urban counterparts. The income of the agrarian population also remains seasonal. They are more inclined towards traditional and conventional tools to deal with health

problems particularly of females due to social norms. On the other hand urban population has more access to health service due to education, information and awareness.

At the national level disparity not only exists at rural urban level but it also exists among provinces. To see the effect of existence of a household in a province on the utilization of prenatal-care, we have included the dummy variables of provinces in the analysis. A woman belonging to Balochistan is found less likely to take prenatal consultation at proper time. It is supported by literature for prenatal consultation and Tetanus Toxoid vaccination by women in Pakistan [17]. The explanation is based on the fact that in Balochistan, public sector health expenditures are insufficient and the population is scattered. The literacy status particularly of females is much lower in Balochistan as compared to other provinces. Furthermore, cultural set up of the province stands as a hurdle for female health seeking behavior. Majority of the population is living in rural areas. Basic infrastructure of roads and transportation is not sufficient for socio-economic development of the province.

The dummy variables of Punjab and Sind have positive impact on public sector source of consultation. It explains that health-care facilities are better provided by public sector in both of the provinces as compared to other provinces.

CONCLUSION

The empirical evidence emerged from this study has several implications for health policy in Pakistan. Education of the woman should be a part of the policy option. Along with an increase in prenatal-care utilization a variety of spillover effects of female education may be obtained. The socioeconomic status proxied by a number of dummy variables has shown positive effect on parental-care utilization. The policy should have the provision of basic utilities like safe drinking water, sewerage and electricity to the households. The results demonstrate the existence of inequality in prenatal-care utilization in rural and urban areas as well as among provinces. These inequalities explained the lack of regional (rural-urban) and provincial priorities and government health-care expenditures by regions and provinces. The needs of the provinces are not identified and allocation of funds remains lower than the needs. Moreover, public expenditures on health-care are not effectively utilized in provinces. In the context of disparities among provinces there should be stress on

Balochistan in all areas of social and economic development. There should be changes in mechanism of allocation of budgetary resources for provinces.

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