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ORIGINAL ARTICLE

Determinants of Stunting among Children Under Five Years of Age: Evidence from Pakistan Demographic and Health Survey (2017-2018)

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ABSTRACT

Aim: To determine the factors that influence the stunting level of children under the age of five years in Pakistan.
Methods: This study was conducted using Pakistan Demographic and Health Survey (PDHS) 2017-2018 during 2020-2021.The response variable comprised two categories: stunted and not stunted. In this study the demographic and socioeconomic factors affecting stunting are region, birthplace, preceding birth interval, women's education level, husband\partner`s education level, women's age, breast feeding, size of child at birth, total child ever born, type of place of residence, frequency of listening to the radio, sources of drinking facilities, and antenatal visits. A binary logistic regression model was applied to access the relationship between stunting with potential demographic and socioeconomic factors.
Results: The binary logistic regression model identified that the significant factors for stunting of children in the regions of Pakistan are: Punjab (OR=.311, CI; 0.104, 0.934),KPK(OR=0.278,CI; 0.091,0.853), mother education(secondary OR=2.671,CI; 1.025,6.959),father education (Secondary OR=0.370, CI;0.146, 0.938),breastfeeding (1-year OR=0.197, CI; 0.056,0.689), child size (larger than average OR=0.113, CI; 0.020,0.646) and (average OR=0.212, CI;0.047,0.962).
Practical implication: Identifying the determinants of stunting can lead to improved health outcomes for children, including reduced mortality rates, better cognitive development, and improved physical growth.
Conclusion: This study discovered that stunting in Pakistan can be reduced by improving the education level of parents, proper breastfeeding, and proper diet during pregnancy duration.
Keywords: Stunting, Binary logistic model, children, parent's education

INTRODUCTION

Malnutrition remains a foremost public health issue among children under the age of five in developing countries like Pakistan[10]. It also endangers children's physical and mental development, which results in poor academic performance[3]. The most common types of malnutrition in children were stunting, wasting, and being underweight, overweight and obese[8]. In 2014, as worldwide estimate 159 million children under the age of five were stunted, 95 million were underweight, and 50 million were wasted[9].

According to the World Health Organization (WHO), at least 155,52 and 99 million children under the age of five were stunted, wasted and underweight respectively in 2016 worldwide. Malnutrition is one of the leading causes of illness and death in children[10]. It is responsible for at least half of all child mortality worldwide[3]. Children mostly in Asian and African regions of the world are at the greatest risk[8]. For example, approximately half of all stunted kids live in Asian countries[3]. Moreover, Asian countries like India, Pakistan, and Bangladesh, have a particularly high prevalence of malnutrition[10].

Malnutrition is a chronic problem in Pakistan, particularly among children under the age of five years, with the highest rate of child malnutrition in comparison to other developing countries[8]. According to the National Nutrition Survey, 33% of all children were underweighted, approximately 44% were stunted, 15% were wasted, 50% were anemic, and 33% were anemic (iron deficiency). In Pakistan, the frequency of child malnutrition has decreased little over the previous two decades as compared to other developing nations[3]. Low birth weight, improper breastfeeding and exclusive breastfeeding, improper complementary feeding, maternal education, absence of appropriate nutrition knowledge, micronutrient intake, parity, birth spacing, household socioeconomic status, food shortages, lack of sanitation, vaccination and infectious diseases are all factors that contribute to childhood malnutrition[3].

Child growth is an essential measure of nutritional status and community health. Stunting is the most often used indication of child growth among the three anthropometric indices. According to the World Health Organization (WHO) growth reference standard, stunting is defined as height for age Z (HAZ) scores below the -2 Z-score value[4]. Stunting occurs when a kid is short for their age, mainly as a result of malnutrition, frequent illnesses, and a lack of social interaction. Stunting is one of the most critical and difficult public health issues in the world[1]. One out of every four children under the age of five is stunted[6].

According to the newest version of the Global Nutrition Report 2018, India has the highest number of stunted children (46.6 million), followed by Nigeria (13.9 million) and Pakistan (10.7 million). These three nations are home to nearly half of all stunted children (47.2%). Previous research has indicated that individual child features, such as age, gender, birth interval, birth order, and birth weight, are related to stunting[14].Several studies have found that children living in urban slums had a 50% greater prevalence of stunting than those living in rural regions[7].

Stunting has an immediate impact on children's growth and development, as well as long-term consequences as adults. It has been linked to poor academic performance in children and lower work productivity in adults. Stunting in children is linked to an increased risk of obesity, chronic diseases such as type 2 diabetes, heart disease, diabetes, and mental disorders problems later in life. Numerous studies have explored variables linked with stunting in the community, emphasizing these characteristics as complex and multi-dimensional at the individual, family, community, and national levels. According to research, the most prevalent variables related to stunting are individual mother characteristics (education, small height, poor dietary health before or during pregnancy), child factors (illness, age, improper feeding practices including unhealthy diet during the 1000 days of life and disease)[15]. Research done in Dhaka city found that mothers' height, birth weight, fathers' educational status, mothers' nutrition awareness, and duration of feeding are all important variables that have independent and direct impacts on preschool children's stunting[13]. This paper is aimed at understanding the determinants of stunting among children under five years of age in Pakistan.

The study can help raise awareness among parents, caregivers, and health professionals about the causes and consequences of stunting. This can lead to a better understanding of the importance of good nutrition, hygiene, and healthcare practices to prevent stunting. By identifying the determinants of stunting, the study can inform policy makers and health

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professionals on effective interventions to reduce stunting prevalence.

METHODOLOGY

Data Source: Data was sourced from the Pakistan Demographic and Health Survey (PDHS) 2017-2018, which was the fourth edition of the survey. The PDHS was carried out by NIPS and the Ministry of National Health Services, Regulations and Coordination (NHSRC) in Pakistan. To gather information on various topics, the survey utilized six different questionnaires, namely women's and household questionnaires.

Sampling design: The 2017-18 PDHS used a two-stage sample design that was stratified. The eight regions were split into rural and urban areas to create 16 sampling strata. The sample selection was carried out independently in each stratum, using a two-stage selection process. At the lower administrative levels, implicit stratification and proportional allocation were achieved by sorting the sampling frame within each stratum, according to administrative units at different levels. The first stage of sampling used a probability-proportional-to-size selection method.

In the first stage, clusters comprising of Enumeration Blocks (EBs) were selected as sample points. The selection of EBs was based on a probability-proportional-to-size method, where the size of the EB was determined by the number of households residing in it during the census. A total of 580 clusters were selected.

In the second stage, households were selected using a systematic sampling method. A household listing operation was conducted in all of the selected clusters, and 28 households were selected from each cluster using an equal probability systematic selection process. This resulted in a total sample size of around 16,240 households. The household selection was carried out centrally at the NIPS data processing office, and the survey teams only interviewed the pre-selected households. To prevent any bias, no replacements or changes to the pre-selected households were allowed during the implementation stages.

The sample was not self-weighting because of non-proportional sample allocation. Therefore, weighting factors were computed, appended to the data file, and applied to ensure that the results were representative at the national level for Pakistan, including FATA and ICT Islamabad. Additionally, the results were separately representative for Azad Jammu and Kashmir and Gilgit Baltistan.

Statistical Analysis: This study included a total of 12,708 children aged 0-5 years. The dependent variable was stunting, which was divided into two categories: stunted and not stunted. The response variable for the ith child was represented by a random variable Xi with two possible values coded as 0 and 1. If the child was not stunted, the response variable was coded as Xi=0. If the child was stunted, the response variable was coded as Xi=1.

The PDHS (2017-2018) used a stratified two-stage sample design, and the relevant independent factors selected from the survey were region, birthplace, preceding birth interval, women's education level, husband/partner's education level, women's age, breastfeeding, size of child at birth, total number of children ever born, type of place of residence, frequency of listening to the radio, source of drinking facilities, and antenatal visits. The relationship between these factors and stunting was investigated using a binary logistic regression model.

RESULTS AND DISCUSSIONS

The basis of this study is the Women's and Household data from the Pakistan Demographic and Health Survey (PDHS) conducted in 2017-2018. The survey covered various topics such as background characteristics (including age and education), antenatal, delivery, and postnatal care, breastfeeding and infant feeding practices, women's work, husbands' background characteristics and knowledge, attitudes, and behaviors related to other health issues. Table 1 provides a detailed description of the factors used in the statistical analysis.

Table 1: Description of factors affecting stunting in PDHS (2017-2018)

Factors	Categories & Code No.(Percentages)
Region	1=Punjab (21.7%) 2=Sindh (17.9%) 3=KPK (16.5%) 4=Baluchistan (11.9%) 5=GB (7.2) 6=ICT (6.4) 7=AJK (10.4) 8=FATA(8.0)
Frequency of listening to the radio	0=Not at all (90.2%) 1= less than one week (5.1%) 2=At least once a week (4.6%)
Birth Place	0=Home (34.9%) 1=Private/public (64.9%)
Total children ever born	1(12.5%), 2(23.0%), 3(20.0%), 4(15.7%), 5(10.4%), 6(7.0%), 7(4.5%), 8(2.9%), 9(1.8%), 10(1.2%), 11(0.7%), 12(0.2%), 13(0.1%), 14(0.1%), 15(0.0%)
Preceding Birth Interval	0= less than 12 months (3.4%) 1=13 to 23 months (21.8%) 2=24 to 47 months (35.7%) 3=48 and onward (15.0%)
Women Education level	0=No education (51.4%) 1=primary (13.5%) 2=middle (8.9%) 3=secondary (11.8%) 4=higher (14.3%)
Husband\partner`s Education Level	No education (28.1%) 1=Primary (14.2%) 2=Middle (13.8%) 3=Secondary (21.3%) 4=Higher (22.3%) 8=Don't know (0.3%)
Women Age	1=15 to 19 (1.1%) 2=20 to 24 (7.9%) 3=25 to 29 (12.0%) 4=30 to 34 (9.3%) 5=35 to 39 (5.3%) 6=40 to 44 (1.5%) 7=45 to 49 (0.6%)
Breast Feeding	1= One year (18.3%) 2=Two years (9.7%) 3=Three years (2.1%)
Size of child at birth	1=very large (0.7%) 2=larger than average (7.2%) 3=average (74.1%) 4=smaller than average (13.3%) 5=very small (4.2%) 6=don't know (0.4%)
Type of place of residence	1=Urban (44.1%) 2=Rural (55.9%)
Source of drinking facilities	0=Impure (6.0%) 1=Pure (90.7%)
Antenatal visits	0=No visits 1=At least 1 visit (5.2%) 2=2 to 3 visits (17.8%z) 3=more than 4 (32.3%)
Dependent variable Stunted	0=Not stunted (20.2) 1=Stunted (12.4)

It is observed from Table 1 that the stunting level is highest in the Punjab region at 21.7% as compared to the rest of the regions. Listening to the radio did not at the maximum percentage of stunting which is 90.2%. A child born at public/private sector has the highest level of stunting 64.9%.The total child ever born with 2 children has the highest percentage 23% than the other number of children.

The child born with the preceding interval of 24 to 47 has the highest level of stunted child 35.7%. It is observed that women's education level affects the stunting level of the child, and‘ no education had the highest level of stunting 51.4%.Husband/partner with no education had the highest stunting level 28.1%, this shows that the ‘no education’ affect the height of the child.

Size of a child matters for his/her height. Child size with average has the highest stunting level 74.1%, this study shows that average size has the highest level to be stunted. The residents of rural areas have the highest percentage 55.9%,which shows that the rural area has more chance to be stunted. Drinking facilities of pure water has the highest rate to be stunted with

90.7%. Antenatal visits affect the height of the child more than 4 visits has the highest percentage of visiting with the lowest risk of stunting, while the one visit has the highest risk level.

The Binary logistic regression model is applied by including all independent factors to estimate their effect on stunting. Table2 summarizes parameter estimates and odds ratios of the Binary logistic regression model.

Table 2: Parameter estimates and odds ratios of binary logistic regression model for factors affecting stunting in Pakistan

Parameter	β	P-value	Odd ratio (CI)
Intercept	-	0.424	4.386(0.116,165.30)
Type of place of residence (urban)	-2.78	.356	.757(0.418,1.36)
Type of place of residence (rural)	.000	-	1.000
Region (Punjab)	-1.167	.037	.311(0.104,0.934)
Sindh	-.756	.207	.468(0.143,1.526)
KPK	-1.280	.025	.278(0.091,0.853)
Baluchistan	-.981	.138	.375(0.103,1.372)
Gb	-	-	-
ICT	-.993	.257	.370(0.066,2.073)
AJK	-	-	-
FATA	0.000	-	1.000
Radio listening (not at all)	-.214	.665	.808(0.306,2.130)
Less than once a week	.299	.716	1.348(2.69,6.751)
At least once a week	.000	-	1.000
All most every day	-	-	-
Mother Education (No Edu)	.704	.138	2.022(0.797,5.127)
Primary	.540	.317	1.717(0.595,4.955)
Middle	.973	.087	2.647(0.866,8.089)
Secondary	.982	.044	2.671(1.025,6.959)
Higher	.000	-	1.000
Father Education (No Edu)	-.023	.954	.977(0.442,2.157)
Primary	.183	.650	1.201(0.543,2.657)
Secondary	-.994	.036	.370(0.146,0.938)
Middle	-.303	.469	.739(0.325)
Higher	0.000	-	1.000
Drinking Facilities (impure)	-.637	.570	.529(0.058,4.792)
Pure	.000	-	1.000
Delivery place 0	-.309	.349	.734(0.384,1.404)
Delivery place 1	.000	-	1.000
Preceding birth in years (less than 12)	.345	.656	1.412(0.308,6.469)
13 to 23	.411	.353	1.508(0.633,3.591)
24 to 47	.218	.527	1.244(0.631,2.450)
48 and onward	.000	-	1.000
Antenatal visits (No visit)	.540	.323	1.716(0.587,5.016)
At least one visit	.275	.340	1.316(0.748,2.316)
2 to 3 visits	.000	-	1.000
Mother age (15-19)	2.377	.155	10.777(0.406,286.125)
20-24	.664	.640	1.942(0.119,31.617)
25-29	.534	.699	1.706(0.113,25.696)
30-34	.763	.584	2.144(0.139,33.044)
35-39	.991	.484	2.694(0.167,43.586)
40-44	2.968	.045	19.458(1.062,356.339)
45-49	.000	-	1.000
Breastfeeding (1 year)	-1.624	.011	.197(0.056,0.689)
1-2 years	-.857	.184	.425(0.120,1.506)
2-3 years	.000	-	1.000
Total children ever born	.052	.481	1.053(0.911,1.218)
Birth in the last five years	-.159	.573	.853(0.490,1.484)
Child size (very large)	-2.704	-	.067(0.067,0.67)
Larger than average	-2.184	.014	.113(0.020,0.646)
Average	-1.553	.044	.212(0.047,0.962)
Smaller than average	-.914	.274	.401(0.078,2.071)
Very small	.000	-	1.000

The reference category of the dependent variable is stunted. The reference category of all independent variables is last. The significant risk factor and their predictive strengths are observed in the above table. Five variables Region (Punjab, KPK), Mother Education secondary), Father Education (Secondary), Breastfeeding (1 year) and Child size (larger than average, average) are found to be significant towards the stunting level of the child.

The results indicate that children who are living in the Punjab region (OR=0.311, 95%CI: 0.104-0.934; P=0.037) and those who are living in the KPK region (OR=0.278, 95%CI: 0.091, 0.853; P=0.025)are significantly less likely to be stunted than the children who are living in FATA region. It demonstrates that the Punjab region reduces stunting by 1.167 times and the KPK region reduces stunting by 1.280 times.

Children whose mothers attain secondary education levels (OR=2.671, 95%CI: 1.025, 6.959; P=0.044) are more likely to be stunted versus not to be stunted compared to those whose mothers has the highest education level. It means that the secondary education level of the mother increases stunting by 0.982 times.

Father's Education has a heavy influence on the model. Children whose fathers attain secondary education levels (OR=0.370, 95%CI: 0.146-0.938; P=0.036) are less likely to be stunted versus not to be stunted as compared to those whose fathers has the highest education level. It means that the secondary education level of the father decreases stunting by 0.982 times.

Children who received breastfeeding for one year (OR=0.197, 95%CI: 0.056, 0.689; P=0.011) are less likely to be stunted versus not to be stunted compared to those children who received breastfeeding for 2-3 years. This shows that breastfeeding for one-year decreases stunting by 1.624 times.

Children who are perceived by their mother to be larger than average in size (OR=0.113, 95%CI: 0.020, 0.646; P=0.014) and those who are perceived to be average in size (OR=0.212, 95%CI: 0.047, 0.962; P=0.044) at the time of delivery are less likely to be stunted versus not to be stunted than children who are perceived to be very small in size at the delivery. This illustrated those children larger than average and average in size decrease stunting by 2.184 and 1.553 times respectively.

This study has comprised strengths and weaknesses. From the comparison of not stunted with stunted it is determined that the factors which have a significant effect on the stunting level of children in Pakistan are region (Punjab, KPK), mother education (secondary), father education (secondary), breastfeeding (1 year), child size (larger than average, average).

A research analysis of five south Asian countries (Pakistan, Maldives, India, Bangladesh, and Nepal) revealed that a mother's education is the most significant factor associated with stunting among children under the age of five years[15]. Our current study also showed that the lack of mother education is the most important factor of stunting among children under 0-5 years in Pakistan.

According to previous research conducted in Punjab, the incidence of stunting in children under the age of five in Pakistan was found to be significantly associated with the literacy levels of both fathers and mothers[11]. Similarly, research conducted in Bangladesh found that parental education was associated with stunting as well[13]. Our current research also highlights the importance of fathers' education in preventing stunting in Pakistan. This emphasizes the need to recognize the significance of education in Pakistan and other South Asian countries. Furthermore, the study in Punjab also identified the size of the child as an important factor in stunting. Similarly, our study demonstrates that the size of the child at birth is a significant factor associated with stunting in Pakistan among children under the age of five[11].

A review of research on child malnutrition in Pakistan found that inadequate breastfeeding is the primary cause of child malnutrition, such as stunting, in the country[3]. Similarly, our study has also revealed that the duration of breastfeeding, specifically only one year of breastfeeding, has a significant impact on child stunting. To further investigate stunting, future studies should include various socio-demographic, lifestyle and child health factors, as well as clinical factors.

CONCLUSIONS

It is observed that the factors which have a significant effect on the stunting level of children in Pakistan are Region (Punjab, KPK), Mother Education (middle), Father Education (Secondary), Breastfeeding (1 year), child size (larger than average, average). It

is necessary to improve parental education levels to reduce stunting in Pakistan. It is also crucial to be aware of the importance of breastfeeding to Pakistani women to reduce the burden of stunting. Mothers should also take a proper diet during pregnancy for the good health of the child.

Ethical Approval: This article does not contain any studies with human participants or animals performed by any of the authors.

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