Prevalence and Determinants of Nutritional Status Among Women and Children in Pakistan

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Abstract

Background: Nutrition has been a low-priority area in Pakistan, with low visibility from the political leadership. Despite various efforts, Pakistan has been reported to have one of the highest prevalence of child and women malnutrition compared to other developing countries. Therefore, this study intends to examine the prevalence and determinants of nutritional status of women and children in Pakistan.

Methods: The present study uses the Demographic Health Survey (DHS) data from Pakistan 2012-13 (PDHS-3). The nutritional status of women was examined through Body-Mass Index (Underweight, normal, overweight, & obese), and that of children was examined through stunting (severe and moderate), wasting (severe, moderate, overweight), and underweight (severe, moderate, overweight). Descriptive statistics and bivariate analysis have been used along with multinomial logistic regression.

Results: A higher proportion of children in rural areas were severely stunted (19.57% vs. 12.49%), severe wasted (2.36% vs. 2.23%), and severe underweight (9.37% vs. 6%) than their urban counterparts. A higher proportion of rural women (9.5% vs. 5.45%) were underweight than urban women, whereas a higher proportion of urban women were obese (24.32% vs. 19.01%) than rural women. The odds of severe stunting (OR= 0.24; C.I.=0.15-0.37), severe underweight (OR= 0.11; C.I.=0.05-0.22) were lower among children from the richest wealth quintile than their poorest counterparts. The Relative Risk Ratio (RRR) of being overweight (RRR= 3.7; C.I.=2.47-5.54) and Obese (RRR= 4.35; C.I.=2.67-7.07) than normal BMI were higher among women from richest wealth quintile than women belonged to poorest wealth quintile.

Conclusion: This study has highlighted determinants associated with maternal and child nutritional status, whereby child's nutritional status was measured by stunting, wasting, and underweight, and the mother's nutritional status was measured by BMI. The main risk factors for child's poor nutritional status include low household wealth, urban residence, and mother's educational status. Similarly, the main risk factors for women's poor nutritional status include increasing the women's age, educational status, rural residence, and household wealth. Emphasis should be placed on educating mothers as it would improve their nutritional status and improve their child's nutritional status simultaneously.

Background

Child undernutrition is a significant public health concern for children under the age of five years in underdeveloped nations including Pakistan. Malnutrition is produced by numerous interconnected causes and has both short and long long-term negative health consequences [1], [2]. According to the 2011 National Nutrition Survey of Pakistan, 31% of children under the age of five are underweight, whereas a recent research in Pakistan found that the current incidence of underweight children in the nation is 29% [1], [3]. Pakistan is identified among those of the seven country that accounted about one-third of population undernourished as Bangladesh, China, Congo, Ethiopia, India, and Indonesia [4].

Undernutrition causes illness and mortality in children, as well as poor physical and cognitive development, poor academic achievement, and a diminished ability to work later in life, resulting in a loss of production and earnings [5]–[7]. As a result, due to its long-term and negative repercussions, undernutrition is one of the most urgent issues of our day [8]. A number of studies reported that inadequate nutrition is the major risk factor for the child malnutrition [9]–[11]. Studies have found that there are multiple factors associated with child undernutrition such as low birth-weight, mother's education, mother's body mass index (BMI), sex of the child, birth order, poor exclusive breast feeding, poor sanitation practices, poverty, dietary diversity, and social inequalities [9], [10], [12]–[16]. Some studies have shown that an individual and community level factors are responsible for the childhood undernutrition [12], [13]. Cumming and Cairncross (2016) concluded that the importance of water, sanitation and hygiene have been recognized as the major risk factors for the health of infant and young children, where the process of stunting is highly concentrated [17]. A study in Uganda stated that children belonging to lower socio-economic strata are more likely to be undernourished, because of higher vulnerability of food insecurity [18].

One of the most important factor responsible for the child undernutrition is the maternal nutritional status [19]. Undernourished women are more likely to bear underweight children, and undernutrition can have an intergenerational effect [20]. A number of studies have documented that there is a significant relationship between mother's poor nutritional status and various pregnancy outcomes such as low birth weight, susceptibility to infections, and growth-challenged and developmentally delayed children [21]. There are several factors that affects the mother's nutrition such as high fertility, poor diet, low socio-economic status, cultural factors, fertility

preferences, closed birth interval. A high fertility rate combined with a lack of birth spacing results in a continuous cycle of pregnancy and breastfeeding, which can deplete a mother's nutritional reserves. As a result, a woman's parity and birth spacing have a major influence on the child's survival prospects [22]. A short inter-pregnancy gap does not provide enough time for the mother to recuperate from the delivery process and restore her reserves of nutrients used during pregnancy, especially when she is undernourished [23].

The country is distinct in its own right, with varied levels of development in terms of nutrition policies and programmes, and different methods to improving nutrition services for women and children. The country offers a wealth of information about what is being done to enhance women's and children's nutrition, as well as what needs to be done. The double burden of malnutrition is becoming a growing problem in Pakistan, with overweight women outnumbering underweight women. It tells riveting tales of how different countries are working to improve women's and children's nutrition. Nutrition, on the other hand, remains an unfinished business for Pakistan's mothers and children. As the country himself acknowledges, much more must be done to enable women to avoid the perils of undernutrition and, indeed, the growing risk of overweight/obesity. In light of the above discussions, this study intends to examine the prevalence and determinants of nutritional status of women and children in Pakistan.

Data And Methods

Data

The present study uses the latest round of Demographic Health Survey (DHS) data from Pakistan 2012-13 (PDHS-3). DHS is considered a nationally representative sample as it covers samples from across the country with a well-specified sampling procedure. All the DHS uses multi-stage stratified sampling for sample selection. Survey collected information on reproductive and child health, family planning, fertility, water and sanitation, nutrition, lifestyle, violence, and other topics using the prescribed format of the questionnaire by DHS with some country-specific modifications.

The sample size of households interviewed was; 12,943 households with 13,558 eligible women and 3,134 men interviewed in Pakistan. For the current study, only household and eligible women's schedules will be used for the analysis.

In the survey, the anthropometric parameters (height and weight) of women and children were also collected. In Pakistan, PDHS measured height and weight of all children aged less than 5 years, however, for women aged 15-49 years, height and weight were measured in every third household selected for male interview.

Variable description:

Dependent variable: The present study is divided into two sections: nutritional status of women aged 15-49 years and nutritional status of children aged less than 5 years in Pakistan. The nutritional status of women is examined through the body mass index (BMI). It is categorised into four categories: Under-weight, Normal weight, Overweight and Obese. However, the nutritional status of children is examined through Z-scores of three parameters: Stunting, Wasting, and Under-weight & Over-weight for age. Stunting is categorised into two categories (Severe and Moderate); Wasting is categorised into three categories (Severe, Moderate, Over-weight); Weight for age is categorised into three categories (Severe underweight, Moderate underweight, and Overweight).

Women nutritional status: Cut-off limit for BMI (Weight for Height):

Underweight: $BMI < 18.5 \text{ kg/m}^2$, Normal weight: $BMI \geq 18.5 \text{ \& } < 24.9 \text{ kg/m}^2$, Overweight: $BMI \geq 30.0 \text{ \& } < 29.9 \text{ kg/m}^2$, Obese: $BMI \geq 30.0 \text{ kg/m}^2$

Children nutritional status: Cut-off limit for Stunting (Height-for-Age):

Severely Stunted: Z-score < -3.0 SD below mean

Moderately Stunted: Z-score < -2.0 SD below mean

Cut-off limit for Wasting (Weight-for-Height):

Severely Wasted: Z-score < -3.0 SD below mean

Moderately Wasted: Z-score < -2.0 SD below mean

Overweight: Z-score > +2.0 SD below mean

Cut-off limit for Weight-for-age:

Severely underweight: Z-score < -3.0 SD below mean

Moderately underweight: Z-score < -2.0 SD below mean

Overweight: Z-score > +2.0 SD below mean

Independent variables: Socio-economic and demographic characteristics of women and children are considered to understand the nutritional status by selected background characteristics. The selected socio-economic and demographic characteristics include: the place of residence (Rural, Urban), religion (Hindu, Muslim, Others), age (continuous), marital status (Married, Unmarried, Others), educational attainment, working status (Yes, No), Source of drinking water, type of cooking fuel, type of toilet facility, and wealth index. Apart from the above-mentioned variables, the number of children and dietary pattern (food composition) of women are considered. For children, the number of siblings, sex, breastfeeding pattern, immunization, and dietary pattern are considered.

Methods

Descriptive statistics and bivariate analysis have been used to understand the nutritional status among women age 15-49 and children aged 0-59 months in Pakistan.

To determine factors associated with Body Mass Index among women, multinomial logistic regression model was used. This allowed us to assess the independent effect of background characteristics in determining the prevalence of BMI. Multinomial logistic regression is an expansion of logistic regression in which one equation is set up for each logit relative to the reference outcome. BMI consist of four categories: normal, underweight, overweight, and obese. For a dependent variable with four categories, this requires the estimation of three equations, one for each category relative to the reference category (not related), to describe the relationship between the dependent and the independents variables:

$$\ln \left[\frac{P(Y_i = 2) | X_i}{P(Y_i = 1) | X_i} \right] = \alpha_2 + \beta_1^2 X_1 \dots \beta_k^2 X_{ik} \dots \dots 1$$

$$\ln \left[\frac{P(Y_i = 3) | X_i}{P(Y_i = 1) | X_i} \right] = \alpha_3 + \beta_1^3 X_1 \dots \beta_k^3 X_{ik} \dots \dots 2$$

$$\ln \left[\frac{P(Y_i = 4) | X_i}{P(Y_i = 1) | X_i} \right] = \alpha_4 + \beta_1^4 X_1 \dots \beta_k^4 X_{ik} \dots \dots 3$$

Where α_2 , α_3 , and α_4 are the intercepts for the category underweight, overweight, and obese, respectively, and β_k^2 , β_k^3 , and β_k^4 are the slope coefficient of the X_i variables for respective category of the dependent variable.

We also used binary logistic regression to determine the factors associated with severe and moderate stunting, severe and moderate wasting, and severe and moderate underweight among children aged 0-59 months. In this analysis, the response variable 'no' was recoded as 0 if the child was not malnourished and, and 1 if with child was malnourished:

$$\log_e [P(Y_i = 1 | X_i) / 1 - P(Y_i = 1 | X_i)] = a + \beta_1 X_{i1}, \dots, \beta_k X_{ik} \dots \dots 4$$

Where Y_i is the binary response variable; X_i is the set of explanatory variables, such as sociodemographic characteristics as mentioned in case of multinomial model; and $\beta_1, \dots, \beta_k$ are the coefficients of the X_i variables.

Results:

Table 1 depicts the percentage distribution of nutritional status of children by various background characteristics. Severe stunting increased with an increase in a child's age, whereas severe wasting decreased with a child's age. Only 9 percent of the children aged 0–12 months were severely stunted compared to almost 19 percent of children aged 49–60 months. A higher proportion of children in rural areas were severely stunted (19.57% vs. 12.49%), severe wasted (2.36% vs. 2.23%), and severe underweight (9.37% vs. 6%) than their urban counterparts. Similarly, a higher proportion of children whose mothers were uneducated were severely stunted (25.03% vs. 6.87%), severe wasted (2.59% vs. 2.26%), and severe underweight (12.74% vs. 2.23%) than those children whose mother had higher

education. Also, a higher proportion of children from the poorest wealth quintile were severely stunted (34.88% vs. 7.7%), wasted (2.63% vs. 1.35%), and underweight (20.2% vs. 3.24%) than children from the richest wealth quintile.

Table 1
Percentage distribution of nutritional status of children according to background characteristics in Pakistan

Characteristics	Severe stunt	Moderate stunt	Severe waste	Moderate waste	Severe under weight	Moderate under weight
Age in months						
00–12	8.9	22.28	5.24	26.56	9.39	20.56
13–24	13.18	33.37	2.38	19.39	6.24	17.45
25–36	22.66	47.1	1.6	16.83	8.79	26.41
37–48	23.39	47.22	1.51	16.04	8.03	25.14
49–60	18.63	38.95	0.56	16.08	8.82	25.48
Place of residence						
Urban	12.49	31.48	2.23	6.64	6.0	19.35
Rural	19.57	40.59	2.36	7.21	9.37	24.69
Educational attainment mother						
No Education	25.03	47.74	2.59	8.75	12.74	31.73
Primary	13.9	38.66	2.8	5.3	5.65	19.46
Secondary	9.17	28.33	1.44	5.63	3.99	15.07
Higher	6.87	16.24	2.26	5.07	2.23	8.52
Source of drinking water						
Piped water	12.96	33.36	1.98	8.0	6.29	22.23
Tubewell/borewell	17.5	38.08	1.81	5.95	9.05	22.7
Protected well	31.85	55.82	5.8	12.62	7.76	34.46
Unprotected well	29.04	58.96	7.19	12.79	22.47	46.37
River/dam/springs	31.98	53.87	7.28	12.98	15.58	36.33
Others	17.57	34.23	2.95	6.47	4.46	16.05
Type of fuel used for cooking						
Clean	10.43	30.31	1.96	7.04	4.74	17.62
Wood	22.04	41.81	2.43	6.39	10.96	26.13
Crop residual	17.35	49.22	0	4.94	7.65	25.72
Animal dung	34.03	51.39	4.29	15.05	23.74	51.27
Others	23.71	44.99	4.47	8.6	7.7	23.18
Current marital status of mother						
Currently married	17.33	37.82	2.34	7.02	8.29	23.1
Others	10.49	21.39	0.91	6.94	5.82	11.77
Sex of household H						
Male	17.42	38.15	2.44	7.44	8.84	24.02
Female	15.75	32.94	1.31	3.52	3.52	14.09

Characteristics	Severe stunt	Moderate stunt	Severe waste	Moderate waste	Severe under weight	Moderate under weight
Type of toilet facilities						
Flush toilet	13	33.16	2.26	6.74	5.9	19.06
Pit latrine	33.66	53.12	3.9	9.74	18.35	42.81
Open	31.22	52.2	1.96	7.65	19.2	37.71
Other	28.2	50.57	2.44	6.75	4.84	22.17
Wealth quintile						
Poorest	34.88	56.08	2.63	9.54	20.2	41.02
Poorer	19.22	44.88	4.08	9.39	9.22	27.39
Middle	10.89	31.15	1.43	4.81	3.18	14.75
Richer	12.06	30.83	1.92	7.21	4.36	18.03
Richest	7.7	22.85	1.35	3.55	3.24	11.39
Total	17.24	37.59	2.32	7.02	8.26	22.93

Table 2 depicts the percentage distribution of the body-mass index of women by various background characteristics. Results found that obesity increased with an increase in age, educational status, and wealth index. Only 4 percent of the women aged 15–19 years were obese compared to almost 30 percent of women aged 45–49 years. A higher proportion of rural women (9.5% vs. 5.45%) were underweight than urban women, whereas a higher proportion of urban women were obese (24.32% vs. 19.01%) than rural women. Almost one in every ten uneducated women (11.12%) was underweight, whereas almost one in every six uneducated women (15.66%) was obese. Almost one-fifth (19.46%) of the poorest women were underweight, and only 3 percent of the richest women were underweight. In contrast, around 7 percent of the poorest women were obese, and almost 31 percent of the richest women were obese.

Table 2
Percentage distribution of women by body mass index according to background characteristics in Pakistan

Characteristics	Under weight	Normal	Over weight	Obese
Age of mothers				
15–19	14.0	59.86	21.81	4.32
20–24	13.23	53.98	22.45	10.33
25–29	7.88	40.67	33.45	18.01
30–34	7.33	40.75	28.81	23.11
35–39	6.06	34.77	30.89	28.28
40–44	3.94	33.66	35.98	26.43
45–49	5.49	29.02	35.28	30.21
Place of residence				
Urban	5.45	33.32	36.91	24.32
Rural	9.5	45.4	26.09	19.01
Educational attainment mother				
No education	11.12	46.44	26.79	15.66
Primary	6.35	40.1	28.46	25.09
Secondary	4.7	34.03	33.61	27.67
Higher	3.74	32.33	38.81	25.12
Source of drinking water				
Piped water	6.48	37.58	33.33	22.61
Tubewell/borewell	8.64	42.37	29.6	19.39
Protected well	8.65	41.83	31.82	17.7
Unprotected well	25.69	35.48	25.51	13.32
River/dam/springs	10.12	57.67	23.55	8.66
Others	5.52	35.52	27.5	31.47
Type of fuel used for cooking				
Clean	4.45	31.91	36.02	27.62
Wood	11.45	47.81	26.33	14.4
Crop residual	13.5	58.99	18.72	8.79
Animal dung	15.8	63.82	10.29	10.09
Others	7.14	47.1	23.52	22.24
Current marital status of mother				
Currently married	7.99	40.63	30.4	20.97
Others	7.05	45.25	24.96	22.73
Sex of household H				
Male	8.17	39.9	30.51	21.42

Characteristics	Under weight	Normal	Over weight	Obese
Female	6.43	47.39	27.99	18.19
Type of toilet facilities				
Flush toilet	5.88	37.1	33.35	23.67
Pit latrine	15.46	56.31	16.99	11.24
Open	20.74	58.4	16.62	4.25
Other	6.85	49.83	19.08	24.24
Wealth quintile				
Poorest	19.46	57.44	16.19	6.9
Poorer	8.64	50.37	25.82	15.17
Middle	6.52	37.42	32.97	23.08
Richer	4.83	36.35	32.84	25.97
Richest	2.81	26.84	39.81	30.54
Total	7.96	40.8	30.21	21.03

Table 3 depicts the binary logistic odds ratio results for stunting, wasting, and underweight among children in Pakistan. The odds of severe stunting (OR = 0.24; C.I.=0.15–0.37), severe underweight (OR = 0.11; C.I.=0.05–0.22) were lower among children from the richest wealth quintile than their poorest counterparts. Similarly, the odds of severe wasting (OR = 0.59; C.I.=0.39–0.91) and severe underweight (OR = 0.66; C.I.=0.5–0.88) were lower among rural children than their urban counterparts. Furthermore, results noted lower odds of severe stunting (OR = 0.39; C.I.=0.27–0.57) and severe underweight (OR = 0.56; C.I.=0.32–0.99) among children whose mothers have higher education than those whose mothers were uneducated.

Table 3

Results of binary logistic odds ratio of moderating stunting, wasting and underweight among children age 0–59 month in Pakistan

Characteristics	Severe stunt	Moderate stunt	Severe waste	Moderate waste	Severe under weight	Moderate under weight
Wealth quintile						
Poorest ®						
Poorer	0.51*** (0.4,0.64)	0.55*** (0.44,0.68)	1.51(0.88,2.62)	1.15(0.81,1.65)	0.55*** (0.4,0.76)	0.56*** (0.45,0.7)
Middle	0.39*** (0.29,0.53)	0.46*** (0.36,0.6)	0.53(0.25,1.13)	0.64* (0.41,1.02)	0.25*** (0.16,0.4)	0.39*** (0.29,0.52)
Richer	0.36*** (0.25,0.52)	0.38*** (0.28,0.51)	0.52(0.22,1.21)	0.65(0.39,1.09)	0.25*** (0.15,0.42)	0.37*** (0.26,0.51)
Richest	0.24*** (0.15,0.37)	0.26*** (0.19,0.37)	0.45(0.17,1.18)	0.34*** (0.18,0.63)	0.11*** (0.05,0.22)	0.18*** (0.12,0.28)
Age of mothers						
15–19 ®						
20–24	1.56(0.92,2.65)	1.24(0.82,1.87)	1.02(0.38,2.71)	1.14(0.56,2.31)	0.99(0.53,1.85)	0.86(0.55,1.33)
25–29	1.44(0.85,2.42)	1.37(0.91,2.05)	0.67(0.25,1.78)	1.05(0.53,2.1)	0.81(0.44,1.5)	0.92(0.6,1.42)
30–34	1.41(0.83,2.39)	1.23(0.82,1.85)	0.75(0.28,2.01)	1.08(0.54,2.18)	0.76(0.41,1.43)	0.95(0.61,1.47)
35–39	1.31(0.76,2.27)	1.13(0.74,1.73)	0.54(0.19,1.56)	0.89(0.43,1.85)	0.73(0.38,1.41)	0.82(0.52,1.29)
40–44	1.69*(0.9,3.14)	1.31(0.79,2.15)	0.98(0.3,3.13)	1.21(0.53,2.76)	0.72(0.33,1.58)	1.14(0.67,1.93)
45–49	1.16(0.52,2.57)	0.65(0.33,1.29)	0.28(0.03,2.52)	0.48(0.13,1.85)	0.33*(0.1,1.08)	0.77(0.38,1.56)
Place of residence						
Urban ®						
Rural	0.94(0.77,1.15)	0.89(0.76,1.04)	0.59** (0.39,0.91)	0.68*** (0.51,0.89)	0.66*** (0.5,0.88)	0.81** (0.68,0.98)
Sex of household H						
Male ®						
Female	0.9(0.68,1.18)	0.93(0.75,1.16)	0.66(0.31,1.37)	0.57** (0.36,0.9)	0.51*** (0.32,0.83)	0.73** (0.56,0.95)
Source of drinking water						
Piped water ®						
Tubewell/borewell	0.98(0.8,1.2)	0.93(0.8,1.1)	0.94(0.59,1.5)	0.83(0.62,1.12)	1.13(0.85,1.51)	0.92(0.77,1.11)
Protected well	1.32(0.87,1.99)	1.21(0.85,1.72)	3.12*** (1.58,6.19)	2.54*** (1.57,4.1)	1.23(0.68,2.22)	1.3(0.88,1.91)
Unprotected well	1.21(0.73,2.01)	1.38(0.85,2.25)	3.07** (1.24,7.58)	1.81*(0.94,3.5)	2.2*** (1.27,3.83)	1.62** (1.01,2.59)
River/dam/springs	0.9(0.66,1.22)	0.75** (0.58,0.97)	1.05(0.52,2.11)	1.26(0.83,1.92)	0.75(0.48,1.17)	0.77* (0.58,1.03)
Others	1.44** (1.02,2.04)	1.08(0.81,1.42)	1.84* (0.96,3.53)	1.53* (0.99,2.36)	2*** (1.28,3.12)	1.37** (1.01,1.87)
Type of fuel used for cooking						

Characteristics	Severe stunt	Moderate stunt	Severe waste	Moderate waste	Severe under weight	Moderate under weight
Clean ®						
Wood	0.98(0.76,1.27)	0.88(0.72,1.07)	0.97(0.56,1.65)	0.83(0.59,1.17)	0.9(0.63,1.29)	0.84(0.67,1.06)
Crop residual	0.84(0.49,1.44)	0.97(0.61,1.55)	1*** (0,0)	0.63(0.26,1.56)	0.42** (0.18,0.95)	0.7(0.42,1.17)
Animal dung	1.43(0.85,2.39)	1.08(0.67,1.74)	1.19(0.37,3.78)	1.74(0.88,3.45)	1.34(0.71,2.5)	1.97*** (1.21,3.2)
Others	0.89(0.56,1.42)	0.85(0.58,1.24)	3.05** (1.29,7.21)	1.81** (1.01,3.27)	1.07(0.56,2.02)	1.04(0.68,1.57)
Type of toilet Facilities						
Flush toilet ®						
Pit laterine	1.54*** (1.13,2.1)	1.34** (1.01,1.79)	0.87(0.42,1.79)	0.84(0.52,1.36)	1.22(0.81,1.83)	1.39** (1.03,1.86)
Open	1.19(0.91,1.57)	1.11(0.87,1.43)	0.78(0.4,1.5)	1.01(0.67,1.53)	1.55** (1.1,2.19)	1.21(0.93,1.57)
Other	1.55** (1.07,2.25)	1.74*** (1.23,2.45)	0.14*** (0.04,0.49)	0.37*** (0.19,0.73)	0.52** (0.28,0.97)	0.86(0.59,1.24)
Current marital status						
Never in union ®						
Currently married	0.94(0.41,2.18)	0.77(0.4,1.49)	0.78(0.1,5.86)	1.27(0.44,3.66)	1.01(0.3,3.41)	0.96(0.45,2.03)
Others						
Educational attainment						
No education ®						
Primary	0.69*** (0.53,0.89)	0.78** (0.64,0.96)	0.8(0.45,1.42)	0.61** (0.41,0.9)	0.64** (0.43,0.94)	0.77** (0.61,0.98)
Secondary	0.53*** (0.4,0.69)	0.65*** (0.53,0.78)	0.54** (0.29,1)	0.75(0.53,1.06)	0.61** (0.41,0.92)	0.63*** (0.5,0.8)
Higher	0.39*** (0.27,0.57)	0.41*** (0.31,0.53)	0.71(0.34,1.5)	0.71(0.45,1.12)	0.56** (0.32,0.99)	0.41*** (0.3,0.58)
CI-95%, Significance ***p < .001., ** p < 0.01, *p < 0.05						

Table 4 depicts the relative risk ratio of BMI among women in Pakistan by various background characteristics. The results found that the RRR of being overweight (RRR = 3.32; C.I.=2.14–5.17) and obese (RRR = 15.86; C.I.=7.42–33.91) than normal BMI was higher among women aged 45–49 years of age than women aged 15–19 years of age. The RRR of being underweight (RRR = 0.72; C.I.=0.51–1.01) than normal BMI was lower among rural women than in urban women. In contrast, the RRR of being obese (RRR = 1.46; C.I.=1.17–1.82) than normal BMI was higher among rural women than in urban women. The RRR of being underweight decreased with an increase in household wealth quintile, whereas the RRR of being overweight and obese increased with an increase in household wealth quintile. The results found that the RRR of being underweight (RRR = 0.38; C.I.=0.2–0.75) than normal BMI was lower among women from the richest wealth quintile than women who belonged to the poorest wealth quintile. Furthermore, the RRR of being overweight (RRR = 3.7; C.I.=2.47–5.54) and Obese (RRR = 4.35; C.I.=2.67–7.07) than normal BMI were higher among women from richest wealth quintile than women belonged to poorest wealth quintile.

Table 4
Results of multinomial logistic regression relative risk ratio of BMI among women in Pakistan

Characteristics	Under-weight	Overweight	Obese
Age of mothers			
15–19 ®			
20–24	1.1(0.68,1.8)	1.06(0.7,1.6)	2.42**(1.14,5.16)
25–29	0.85(0.51,1.4)	2.24*** (1.5,3.34)	6.05*** (2.89,12.66)
30–34	0.71(0.43,1.19)	1.9*** (1.27,2.85)	8.13*** (3.89,16.98)
35–39	0.7(0.41,1.2)	2.45*** (1.63,3.7)	11.93*** (5.69,24.97)
40–44	0.48** (0.25,0.92)	2.94*** (1.91,4.54)	12.23*** (5.74,26.08)
45–49	0.78(0.42,1.44)	3.32*** (2.14,5.17)	15.86*** (7.42,33.91)
Place of residence			
Urban ®			
Rural	0.72*(0.51,1.01)	0.88(0.72,1.08)	1.46*** (1.17,1.82)
Sex of household H			
Male ®			
Female	0.71*(0.48,1.06)	0.8*(0.63,1.01)	0.7** (0.54,0.92)
Source of drinking water			
Piped water ®			
Tubewell/borewell	1.02(0.76,1.38)	1.03(0.86,1.23)	0.98(0.8,1.2)
Protected well	1.1(0.46,2.59)	1.33(0.76,2.32)	1.17(0.6,2.3)
Unprotected well	2.43** (1.12,5.25)	2.35** (1.1,5.02)	2.27* (0.88,5.89)
River/dam/springs	0.71(0.4,1.29)	0.97(0.64,1.48)	0.64(0.35,1.16)
Others	1.26(0.72,2.2)	0.86(0.63,1.19)	1.34* (0.96,1.86)
Type of fuel used for cooking			
Clean ®			
Wood	1.11(0.75,1.64)	0.98(0.78,1.24)	0.72** (0.56,0.94)
Crop residual	0.98(0.52,1.86)	0.66(0.4,1.09)	0.4*** (0.21,0.78)
Animal dung	1.04(0.55,1.95)	0.34*** (0.18,0.64)	0.47** (0.24,0.92)
Others	0.92(0.47,1.82)	0.94(0.61,1.45)	0.75(0.45,1.26)
Type of toilet Facilities			
Flush toilet ®			
Pit laterine	1.19(0.75,1.91)	0.6** (0.39,0.92)	0.69(0.41,1.14)
Open	1.5** (1.05,2.16)	0.72* (0.51,1)	0.32*** (0.19,0.54)
Other	0.75(0.34,1.64)	0.62* (0.36,1.08)	1.07(0.59,1.94)
Current marital status			
Never in union ®			
Currently married			

Characteristics	Under-weight	Overweight	Obese
Others	1.03(0.52,2.01)	0.64**(0.42,0.98)	0.78(0.5,1.22)
Educational attainment			
No education ®			
Primary	0.83(0.57,1.21)	0.99(0.79,1.25)	1.36**(1.05,1.76)
Secondary	0.83(0.54,1.26)	1.06(0.84,1.33)	1.46*** (1.12,1.89)
Higher	0.77(0.45,1.35)	1.08(0.82,1.42)	1.04(0.76,1.42)
Wealth quintile			
Poorest ®			
Poorer	0.61*** (0.43,0.88)	1.64*** (1.21,2.21)	1.7*** (1.14,2.52)
Middle	0.66* (0.42,1.03)	2.46*** (1.76,3.43)	2.71*** (1.78,4.13)
Richer	0.5** (0.29,0.86)	2.43*** (1.68,3.52)	3.06*** (1.94,4.8)
Richest	0.38*** (0.2,0.75)	3.7*** (2.47,5.54)	4.35*** (2.67,7.07)
<i>CI-95%, Significance ***$p < .001$., ** $p < 0.01$, *$p < 0.05$; Base category for multinomial is normal BMI</i>			

Discussion:

This research paper investigated the factors associated with the nutritional status of mothers and their children. The three indicators, namely; stunting, wasting, and underweight, were categorized to examine nutritional status among children, whereas nutritional status among mothers was categorized by body-mass index. The study has revealed that almost one-sixth (17.24%) of the children were severely stunted, another two percent were severely wasted, and almost 8 percent were severely underweight. Furthermore, the results revealed that the risk of severe stunting was higher among the poorest children and children whose mothers were uneducated. Similarly, severe wasting was higher among urban children, and the risk of severe underweight was higher among the poorest children, urban children, male children, children defecating in the open, and children whose mothers had no education.

Nutritional status among children:

Corroborating with previous findings [1], [24]–[27], this study noted the reduced risk of severe stunting among children whose mother had higher education. In a few studies, maternal education was associated with greater reductions in the odds of stunting among children than paternal education [27], [28]. Mothers are primary caregivers for the children, and therefore, their education level can have a direct and substantial impact on child stunting than that of fathers [27]. Lower levels of education among mothers could result in limited family income and has consequences on individual care and attention given to the child [25]. Furthermore, educated mothers are more likely to be conscious about their child's health, thereby improving stunting levels [29].

The study further noted higher odds of stunting among children who belonged to the poorest households. Several previous literature pieces agree with these findings [1], [25], [28], [30]–[32]. The effect of increasing wealth on reducing stunting could be explained by the increasing purchasing capacity that promotes and protects children's health. Several studies have examined an association between low income and malnutrition, often leading to stunting [33], [34]. Children belonging to poor households tend to have limited access to food and healthcare services, making them more vulnerable to growth failure [35].

Unlike previous studies [1], this study failed to find a concrete association between wasting and maternal education and household wealth. Results found that the odds of severe wasting were lower among rural children and higher among children drinking water from protected or unprotected well. Deviating from this study finding, a study conducted in six Asian countries, including Pakistan, noted a higher risk of wasting among rural children [36]. Why the wasting is lower among rural children in Pakistan should be explored in future studies as several previous studies have noted an otherwise finding in Pakistan [37]. Wasting, being an acute form of malnutrition, could partially explain the higher odds of wasting among urban children in this study. It is suggested to carry out further study to examine the determinants of rural-urban differential in wasting in Pakistan. Countering urban-rural differential in 15 sub-

Saharan African countries, a study noted narrowing urban-rural differential in child undernutrition due to an increase in undernutrition in urban areas [38].

In agreement with previous studies, this study noted that drinking water from well and other sources lead to higher odds of wasting than drinking piped water [36], [39], [40]. Exploring the social context of wasting across regions, a study showed that access to safe water is a crucial determinant of wasting in Asian countries [41]. Drinking water from unimproved sources may cause diarrhea which could further lead to wasting among children [39]. No matter, drinking water from protected well also led to higher odds of wasting among children in this study as people use groundwater without any treatment leading to diarrhea and further wasting among children in Pakistan [39]. Since wasting is an acute form of malnutrition, it is easily manipulated by diarrheal conditions in Pakistan [39]. Diarrhea results in poor digestion, malabsorption, and lower appetite leading to short-term acute malnutrition, also known as wasting among children [42].

In agreement with existing scholarship [1], [43], this study noted reduced odds of underweight among children with increased household wealth. Low household economic status can contribute significantly to the poor nutritional status of mothers, which further has a bearing on nutritional outcomes among children [44], [45]. Agreeing with previously available literature [1], [24], [28], [35], [43], [46], [47], the findings from this study noted reduced odds of underweight among children with an increase in maternal educational status. Educated mothers are well-informed about the nutritional choices for their children and prefer to follow hygiene and sanitation practices leading to reduced risk of underweight among children [1]. To add more, educated mothers make better choices of available health services for improved healthcare of their children [43].

Nutritional status among women:

Other than examining the children's nutritional status, this article also examines the nutritional status of the women, albeit with a different indicator. Body-mass index indicator was used to assess the women's nutritional status and examine the predictors of nutritional status among women in Pakistan. In line with previous findings, the study noted a higher odds of overweight and obesity among women at higher ages [48]–[51]. Parity increases with an increase in age and could be a plausible factor of higher obesity among women [52], [53]. Another plausible reason for obesity among women at high age is that women at older ages are more likely to remain physically inactive and consume more energy-dense food leading to obesity [54]. Another plausible reason could be the change in body composition due to increased age, leading to an increase in body fat mass [55].

The odds of being obese were higher among educated women than their uneducated counterparts, similar to the previous study finding [56]–[58]. A plausible fact is that educated women are less involved in physical activity leading to a higher risk of obesity [59]. In addition, women with high education levels tend to have better financial status than uneducated women [60], which further is linked to higher odds of obesity among women [44], [45]. Similar results were also noted in this study, where higher odds of overweight and obesity among women from the richest wealth quintile were observed. Several previous studies also noted a higher risk of obesity among rich women [57], [61], [62]. The high risk of obesity among rich women could be attributed to the notion that rich people follow a sedentary lifestyle and are engaged in less labour intensive work [63]. Moreover, rich people tend to consume more energy due to a greater purchasing capacity leading to obesity [59]. In addition, affluent women are more likely to follow a sedentary lifestyle such as viewing television, which is further linked to higher obesity [64].

The results found that the odds of underweight were lower among rural women, and odds of obesity were higher among rural women. This finding deviates from several previous findings where the risk of obesity was higher among urban women [49], [65], [66]. The rural areas are also experiencing nutritional transition, and people in rural areas prefer fast foods and other energy-dense food [58]; all this could have led to higher obesity risk among rural women. Furthermore, a multi-country study has confirmed that over the three decades from 1985-2017, a large share of the increase in obesity worldwide is attributed to the increase in obesity in rural areas [67]. People in rural areas are fast adopting the lifestyle followed in urban areas and are more vulnerable and susceptible to chronic illnesses, including obesity [68].

Strengths and limitations of the study:

This study utilized data from a nationally representative survey, giving nationally-comparable estimates. One key limitation, however, was that we could not establish the cause and effect relationships; because of the cross-sectional nature of the study design

Conclusion:

This study has highlighted determinants associated with maternal and child nutritional status, whereby child's nutritional status was measured by stunting, wasting, and underweight, and mother's nutritional status was measured by BMI. The main risk factors for child's poor nutritional status include low household wealth, urban residence, and mother's educational status. Similarly, the main risk factors for women's poor nutritional status include increasing age of the women, educational status of the women, rural residence, and household wealth. The findings indicate the need for interventions to improve nutritional status among children and women. Emphasis should be placed on educating mothers as it would not only improve their nutritional status but also improves their child's nutritional status simultaneously. Furthermore, policies focusing on poverty alleviation and improving the nutritional status of poorer sections of society are needed to address the nutritional disadvantages among women and children belonging to poor households.

Abbreviations

BMI: Body Mass Index

CI: Confidence Interval

CIDA: Canadian International Development Agency

EPI: Expanded Program of Immunization

FP: Family Planning

IMR: Infant Mortality Rate

LHWs: Lady Health Workers

MI: Micronutrient Initiative

MNCH: Maternal and Child Health

OR: Odds Ratio

PDHS: Pakistan Demographic Health Survey

RRR: Relative Risk Ratio

UNICEF: United Nations. Children Fund

Declarations

Ethics and consent to participate: This study is based on secondary data available in public domain. Anyone can access the data without any legal or ethical considerations. Therefore, there is no ethical approval required for this study as this study did not involve human or animal participants directly.

Consent for publication: Not applicable

Availability of data and materials: The datasets generated and/or analysed during the current study are available with DHS program. The data can be requested at: <https://dhsprogram.com/data/available-datasets.cfm>

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