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PROVINCIAL DISPARITIES, TRENDS AND COEXISTING HEALTH INEQUALITIES AMONG WOMEN OF REPRODUCTIVE AGE AND ITS DETERMINANTS IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT GOALS

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ABSTRACT

Women malnutrition has been identified as a serious issue in Pakistan yet national statistics mask important local differences in malnutrition levels and its determinants. The 2030 Agenda for the Sustainable Development Goals (SDGs) provided a roadmap to achieve and maintain health and nutrition targets. This study aimed to explore the existence of double burden of malnutrition among women in the context of achieving SDG 3, focusing on current research and previous evidence. Most of the prior studies conducted in Pakistan, explore the coexistence of double burden of malnutrition and their determinants among women of reproductive age at national level. This study intended to assess health inequalities and disparities with respect to coexisting forms of malnutrition amongst women of reproductive age and their associated factors at provincial level. The study used Pakistan Demographic and Health Survey (PDHS), 2018. Nutritional status of women has been evaluated on the basis of their body mass index. Trends in malnutrition among women aged 15–49 years were calculated independently for Pakistan's four provinces (Punjab, Sindh, KPK, and Balochistan). Bivariate and multivariate analyses are conducted to identify factors associated with women's malnutrition. There is some disparity with respect to health of different socioeconomic groups across provinces and absence of harmonisation with national policy development activities. Policy priorities and level of progress towards establishing and implementing multisector nutrition action strategies differ between provinces. Nutrition advocacy, community education, defining of cost effective interventions, technical capacity development at district levels and monitoring interim progress are main areas for investment in women's health.

Keywords: Double burden of malnutrition, BMI, Socioeconomic determinants, Pakistan
JEL Codes: L66, A13

1. INTRODUCTION

Maternal malnutrition is of paramount importance in developing countries, especially of the South Asian region. Most of them are affected by a double burden of malnutrition (DBM), defined by the concomitant prevalence of underweight alongside overweight and obesity in an individual, community, household and population (Biswas et al., 2022; Hassan et al., 2021; Kushitor et al., 2020).

Though, the prevalence of underweight is reducing globally yet the rise in obesity is relatively higher (Hashan et al., 2020) and exceeding underweight in all regions (Chakraborty et al., 2022). The world has observed nearly five-fold increased pervasiveness of overweight and obesity among adult women and an eight-fold increased pervasiveness among adult men from 1975-2016. Moreover, the burden of overweight and obesity is greater among South Asian women than men. Nearly one in four young women in the WHO South-East Asian region are vulnerable to undernutrition that is the highest in the world (Gupta et al., 2020). Overall about 11.8% and 36.3% women of reproductive age are underweight and overweight/obese respectively among four South Asian countries includes Pakistan, Nepal, Bangladesh and Maldives, within the time period of 2016-2018 (Farzana Ferdausi et al., 2022). This is attributable to nutritional transition experienced by these countries, along with a rapid change in food production, dietary patterns, rapid urbanization (Gupta et al., 2020), women age, education and socioeconomic status (Amugsi et al., 2019), reduced physical activity (Rana et al., 2021), and unemployment. The level of women's health in Pakistan is significantly worse than other neighboring South Asian countries with low-resource settings

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(Hanif et al., 2021). National Nutrition Survey report, 2018 confirms an alarming health status among women of fertile age as 14.4 % are underweight, 24 % are overweight and 13.8 % are obese (UNICEF, 2022). Provincial territories also divulged similar vulnerability to these fertile aged group of women indicating the prime need to reflect on this DBM (Hashan et al., 2020).

The DBM is of significant importance among women of fertile age as it transmits multiple long-term adverse health consequences to individuals, communities, and health systems (Biswas et al., 2022). Poor nutrition deprives women of their health and well-being (Murira & Torlesse, 2020) (UNICEF, 2018). It is associated with the burden of adverse birth outcomes including maternal mortality, delivery related complications, premature birth and fetal growth restriction (Tadese et al., 2022). Conversely overweight and obesity are key contributors to the non-communicable diseases among women such as cardiovascular diseases cancers, chronic respiratory diseases and diabetes (Hashan et al., 2020; Branca et al., 2015). Therefore, women adequate nutrition is equally important for their own health and of future generations (Feskens et al., 2022).

Since DBM have multifaceted consequences for individuals in terms of longevity and disability, therefore it confers an economic burden on societies and health-care systems by rising health-care costs (Cecchini & Vuik, 2019; Black et al., 2013; Russell, 2007). It reduces academic performance and educational outcomes and there by reduces labour force productivity and human capital and leads to slow economic growth. All this sequentially perpetuate a cycle of poverty and ill-health and serves as a significant barrier to economic and social development. It is therefore regarded that DBM gives rise to its economic toll (Cecchini & Vuik, 2019; WHO, 2016).

The 2030 Agenda for the Sustainable Development Goals (SDGs) provided a roadmap to sustain health and nutrition and promote well-being for all at all ages (SDG 3) (Vagsholm et al., 2020). While explicit in only one SDG, nutrition is an important factor that crosses all the SDGs, in one way or another. Moreover, it directly affects and indirectly influences by almost all SDGs. Thus achieving several SDGs is crucial for achieving the nutrition goal. Pakistan's first Sustainable Development Goals (SDGs) Status Report (2021) identified reduction in maternal mortality, improvement in undernourishment and reduction in anemia rates among women of reproductive age (de Romana et al., 2021; Grosso et al., 2020). Pakistan is on the track to accomplish the targets. But still there is a room of improvement.

To cope with these challenges and alleviate problems associated with this double-edged sword of malnutrition, examination of underlying socioeconomic factors is remarkably important. There are large disparities and gaps in the levels and determinants of DBM across provinces of Pakistan. Most variance is attributable to differences between individuals, of which a large fraction can be explained by their own and household characteristics. The most common of them are women's age (Norman et al., 2021; Anik et al. 2019), educational qualification (Crear-Perry et al., 2021), marital status (Song et al., 2020), working status, place of residence (Sserwanja et al., 2020), dependency ratio (Zhou et al., 2019; Asghar & Muhammad, 2013) and wealth index (Farzana Ferdausi et al., 2022; Hanumant Waghmare et al., 2022; Guevara-Romero et al., 2021; Gupta et al., 2020; Amugsi et al., 2019). The overarching aim of present study is to examine these gaps by simultaneously analysing underweight, overweight and obesity, using a comprehensive list of correlates of DBM among women. Understanding the role and magnitude of these potential confounders is crucial for devising clear and effective strategies for improving health of WRA.

2. MATERIALS AND METHODS

2.1. DATASETS

The data of ever married women of reproductive age were extracted from two most recent rounds of the PDHS, which were conducted in 2012–13 and 2017-18 to evaluate malnutrition rates at provincial levels and trends.

DHS are nationally-representative household surveys, collected and analysed under MEASURE DHS project in collaboration with the National Institute of Population Studies, Pakistan. These surveys provide reliable data information about various monitoring and impact evaluation indicators in the realm of health, nutrition and other socioeconomic characteristics of the population with a special focus on maternal and child health. This information can be used by governmental and non-governmental organisations to inform health-related programming, policies, funding priorities, and research.

2.2. SAMPLING STRATEGY AND SAMPLE SIZE

PDHS, 2018 utilised the sampling frame which is a complete list of enumeration blocks as developed by Pakistan Population and Housing Census 2017. A rigorous area-based sampling design was developed. Two-stage stratified and probabilistic random sampling techniques were followed according to the rural urban areas and geographic or administrative regions. The first step entailed selecting sampling points, drawn with probability proportional to size.

The second step entailed the selection of households through systematic sampling from 580 clusters, later dropped to 561 clusters due to security concerns. Only 28 households per cluster was selected producing a total sample size of almost 16,240 households later reduced to 11,869 households. Smaller regions, including the province of

Balochistan and Urban areas were oversampled. This non-proportional sample allocation has been further adjusted by applying sampling weights so that the results are representative at the national level as well as for other administrative regions. All ever-married women of reproductive age and their children under five were included. However, height and weight information for women and children was collected only for one-third of those sample households selected for the men's survey.

Similarly, the sample universe for the 2012-13 PDHS consisted of all urban and rural areas of the four provinces of Pakistan and Gilgit Baltistan, excluding Azad Jammu and Kashmir and FATA, defined as such in the 1998 Population Census. A sample size of 14,000 households was estimated to provide reasonable precision for the survey indicators. Out of those selected, 13,558 were successfully interviewed.

Overall, the response rates were lower in urban than in rural areas from 2012-2018. 12,364 women of reproductive age out of 11,869 households were successfully interviewed in 2017-18 while 13,558 women of reproductive age out of 12,943 households in 2012–13 were successfully interviewed. The 2017–18 PDHS sample included 1011 women in Punjab, 9280 in Sindh, 766 in KPK and 2089 in Balochistan. The 2012–13 PDHS sample consisted of 1374 women in Punjab, 1024 in Sindh, 924 in KPK and 632 in Balochistan.

2.3. MEASUREMENT OF OUTCOME VARIABLE

Women body mass index (BMI) also referred to as Quetelet's Index, was the outcome variable of interest derived from the estimations of height and weight measurements. DHS survey's trained personnel using standardized instruments and procedures, objectively measures height and weight of the participants. Electronic solar powered scales with a digital screen were used to measure weight accurately while stadiometer produced by Shorr Productions were utilized to measure height of the study subjects in centimeters. Afterwards BMI was estimated by dividing body weight in kg by the squared height in meters. Based on those estimates, participants were then classified underweight, healthy, overweight and obese according to the conventional World Health Organization (WHO) classification system.

BMI has certain categories.

1 =If the Women's BMI lies between 18.5-24.9 (normal)
2 = If the Women's BMI is less than 18.5 (underweight)
3 = If the Women's BMI is between the range of 25-29.9 (overweight)
4 = If the Women's BMI is greater than 30 (obese)

2.4. STUDY COVARIATES AND THEIR MEASUREMENT

The current study tried to examine the impact of demographic and socioeconomic factors on body weight of women of fertile age stratifying by the four provinces of Pakistan. These potential confounders were identified based on biological plausibility, data structure and published literature and further subjected to bivariate analysis to establish their relationship with the DBM indicators. All statistically significant variables were included in the multivariable analysis. The following predictor variables were included: women's age at the time of survey, education, employment status, number of births, place of residence, household size, dependency ratio, husband's education and employment and household wealth index. The definition and categories of these explanatory variables are summarized in table 1.

Household wealth status was captured through a composite index of relative standard of living derived from country-specific indicators of asset ownership, household construction materials, water and sanitation facilities, electricity and use of health services and other amenities. Primarily, wealth quintiles are retrieved by allocating the household score to each corresponding household member, ranking each person in the population by his or her score and then successively re-categorised into quintiles, each covering a fifth part of the total sample. Socioeconomic factors, such as wealth index and education level, were shown to be valid when collected through population-based surveys (Kim et al., 2018).

The demographic dependency ratio can be calculated by first constructing the dependency and support functions. The dependency function Dep (X_i) shows the number of the dependents in a population and takes the value of 1 to the respondents whose age is below a certain limit (mostly 15) and over a certain limit (mostly 65) and 0 otherwise. While the support function Sup (X_i) shows the working age population and assigns the value of 1, if the respondent age falls between a specific age limit (usually 15- 64) and 0 otherwise. Then we divide dependency function Dep (X_i) by the support function Sup (X_i) and multiply the result by 100. After calculating, DR was coded in four categories. DR shows the weight of the burden on any economy in supporting its non-productive labour force. The higher the DR, the greater would be the pressure on the working-age people.

An interaction term of educated mother's working status is also included in the model to illustrate the combined effect of women learning and empowerment on their health whether women's education and their tendency to have an active social working life is related to their health status or not.

Similarly, parity identifies the number of the total children born to a mother. Every gestation period carries its risks. It is obvious that the mothers with five and more pregnancies are more susceptible to malnutrition (Stickler, 2018).

Table 1: Description of Independent Variables

Place of residence	POR	1 = Urban and 2 = Rural
Wealth Status of the Household	WSH	1 = richest, 2 = richer, 3 = Middle- class, 4 = poorer & 5 = poorest
Family size of the household	FSH	1 = If the household retain 2 -4 members (small), 2 = If the household, retain 5-6 members (medium sized) , 3 = If the household, retain 7-8 members (large) & 4 = If the family size is above 8 members (extended)
Dependency ratio within the household	DRH	1 = 50 % dependency, 2 = up to 100 %, 3 = above 100 and below 200 % & 4 = 200% and Above 200 % dependency
Husband's Education	HEDU	1 = higher, 2 = secondary level, 3 = Primary & 4 = uneducated fathers
Husband's Occupation	HOCU	1 = professionals/technical/managerial, 2 = farmers, 3 = sales, 4 = skilled labour, 5 = unskilled labour, 6 = unemployed
Women's Age	WA	1 =15- 25 years, 2 = 26-35 years & 3 = 36 -49 years
Women's Education	WEDU	1 = higher, 2 = secondary level, 3 = Primary & 4 = uneducated mothers
Women's working status	WWS	1 = working & 2 = not working
Educated Women's Working Status	EWWS	1= Highly Educated and working, 2= Secondary Passed and Working, 3= Primary Passed and Working, 4= Illiterate and working, 5= Not working
Parity	PAR	1 = only having two births(ideal births), 2 = 3-4 births (less births) and 3 = 5 & more births (more births)

3. ANALYTICAL STRATEGY

All statistical analyses were conducted independently for four major provinces of Pakistan (Punjab, Sindh, KPK, and Balochistan), account for more than 95% of the whole population. Two step procedure has been adopted for the analyses. The first step entailed to examine the levels and trends in body weight among women of reproductive age by comparing proportions from the two most recent PDHS surveys (2017-18 and 2012-13). Then we apply bivariate comparisons with selected categorical variables to analyse the association between women health status and independent variables using the data information extracted from DHS 2017–18. Chi-square test has been used to test the level of statistical significance of the variables.

The second step involved to find the association between the DBM and socio-demographic risk factors. For this purpose, multinomial logistic regression was contemplated to be suitable as the outcome variable is polychotomous by nature. All predictors that were significant in the bivariate analysis were included in the multivariate analysis. All analyses were weighted using women's individual sample weights to correct for the disproportionality of the sample and performed using SPSS 20. The logit model calculate the probability of double burden of malnutrition among women of fertile age as

$$P_r(\text{DBM} = j) = \frac{e^{z_i}}{1+e^{-z_i}} \; where\; j = 1,2,3 \qquad (1)$$

The complete explanation of model with dependent variable and its potential confounders can be written as

$$Z_i = \beta_0 + \beta_1 POR + \beta_2 FSH + \beta_3 WSH + \beta_4 DRH + \beta_5 HEDU + +\beta_6 HOCU + \beta_7 WA + \beta_8 WEDU + \beta_9 WWS + \beta_{10} EWWS + \beta_{11} PAR \qquad (2)$$

The same model has been utilized for each province in multivariate analysis.

3.1. ETHICAL CONSIDERATIONS

Data files for the 2 PDHS surveys were requested and received from the DHS programme (www.dhsprogram. com). The survey protocols were approved by institutional review boards in Pakistan and at ICF International; no additional ethical approvals were required for re-analysis of the datasets.

4. RESULTS

4.1. LEVELS AND TRENDS IN BODY WEIGHT OF WRA

Levels and recent trends with respect to DBM among women vary between provinces (Figure 1). From 2012–13 to 2017–18, the proportion of women, having the risk of being underweight decreased in all the provinces under studied, remarkably Balochistan and Sindh have experienced greater declines than others. Whereas a dramatic

increase in overweight and obesity can be observed in almost all the provinces of Pakistan (WHO, 2020). This form of malnutrition was highly prevalent in Balochistan, KPK and Punjab than the national average. The proportion of being overweight among women increased by 5.5 percentage points in Balochistan followed by 3.7 percentage points in Punjab followed by 1.5 percentage points in both KPK and Sindh. While the proportion of obesity among women increased by 7.1 percentage points in Balochistan followed by 3.9 percentage points in KPK followed by 0.9 percentage points in Punjab. The reverse was true in Sindh and dropout rate in obesity was about 2.7 percent.

In contrast, the proportion of women of fertile age who were not suffering from double burden of malnutrition decreased in all the provinces under studied, 8.8 percent in Balochistan followed by 5.3 percent in KPK followed by 3.5 percent in Punjab and followed by 1.6 percent in Sindh.

Therefore it was then concluded that from 2012–13 to 2017-18, all the provinces showed significant improvements on all body weight indicators except overweight and obesity. Another study based on cross sectional data about Pakistan also found that excess weight problem to be quite high in the Pakistani adult female population (Asif et al., 2020). The National Nutrition Survey Report 2018 about Pakistan also verified that the prevalence of undernourishment has been declined from 2011 to 2018 whereas overweight and obesity have been increased (UNICEF, 2018).

Pakistan's first Sustainable Development Report (2021) also has been out and found a considerable reduction in maternal mortality, improvement in undernourishment, food insecurity, extreme poverty and improvement in access to energy (Kiani, 2022). In this context, it is evident from the Table 1 that from 2012-2018, undernourishment among women have been declined but the prevalence of overweight and obesity is slightly increasing almost in all the provinces of Pakistan.

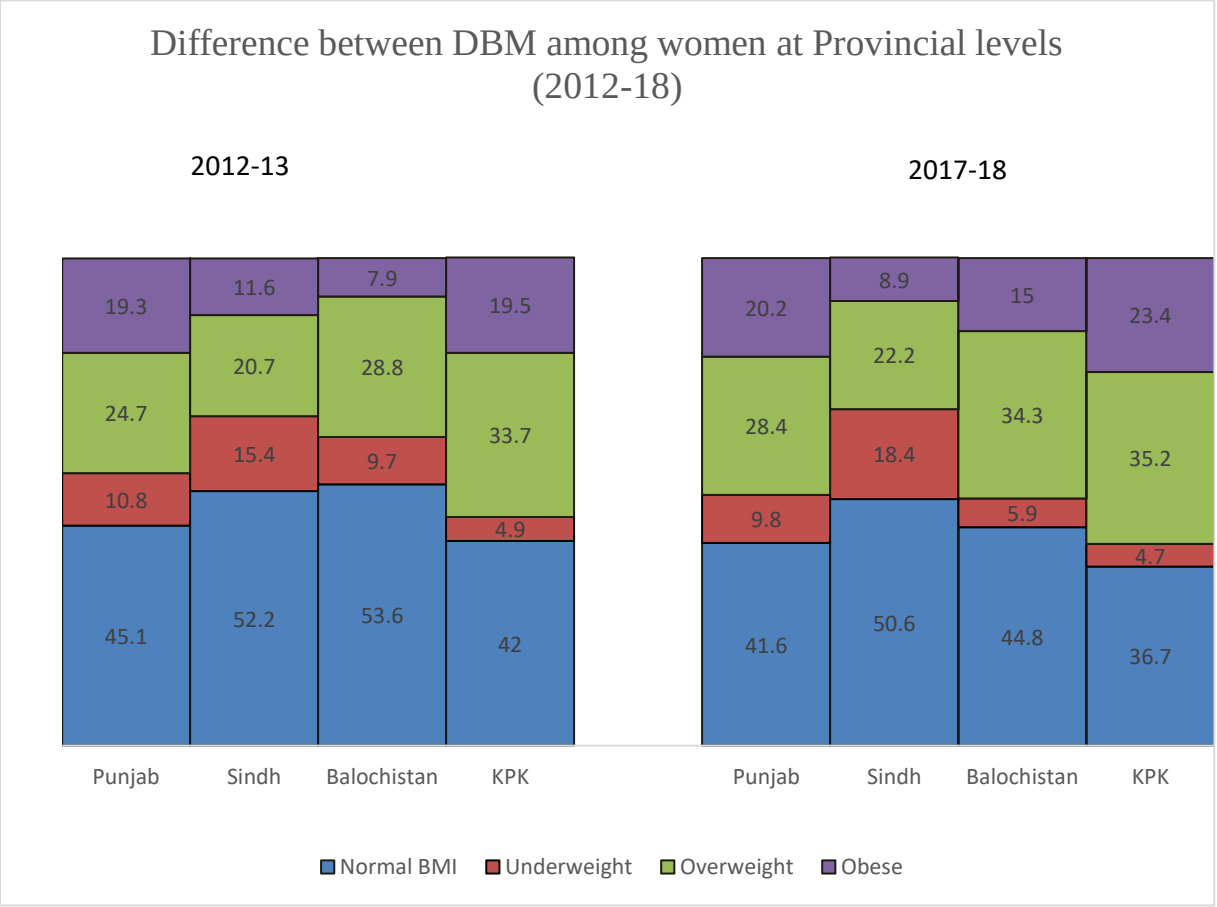

Figure 1 Proportion of double burden of malnutrition among women at provincial level in Pakistan (2012-18)

Table 2: Trends and levels of DBM among Women of fertile age at provincial level

	Punjab			Sindh			Balochistan			KPK		
Women Malnutrition status	**PDHS 2012-13 (n=1374)**	**PDHS 2017-2018 (n=1011)**	**Change**	**PDHS 2012-13 (n=1024)**	**PDHS 2017-2018 (n=9280)**	**Change**	**PDHS 2012-13 (n=632)**	**PDHS 2017-2018 (n=2089)**	**Change**	**PDHS 2012-13 (n=924)**	**PDHS 2017-2018 (n=766)**	**Change**
Normal BMI	45.1	41.6	-3.5	52.2	50.6	-1.6	53.6	44.8	-8.8	42.0	36.7	-5.3
Underweight	10.8	9.8	-1.0	15.4	18.4	3	9.7	5.9	-3.8	4.9	4.7	-0.2
Overweight	24.7	28.4	3.7	20.7	22.2	1.5	28.8	34.3	5.5	33.7	35.2	1.5
Obese	19.3	20.2	0.9	11.6	8.9	-2.7	7.9	15.0	7.1	19.5	23.4	3.9

Table 3: Bivariate analysis of factors associated with women's malnutrition in Pakistan

Variable	women %	Punjab(malnutrition)				P	women %	Sindh (malnutrition)				p	women %	KPK (malnutrition)				P	women %	Balochistan (malnutrition)				
POR		N	U	O	O			N	U	O	O			N	U	O	O			N	U	O	O	P
Urban	37.7	31.8	7.1	35.4	25.7	0.000	45.9	43.8	8.5	33.6	14.1	0.000	49.1	34.9	27.8	53.7	68.7	0.000	29.8	26.1	43.9	29.1	37.1	0.000
Rural	62.3	47.6	11.4	24.1	16.8		54.1	56.3	26.7	12.4	4.6		50.9	65.1	72.2	46.3	31.3		70.2	73.9	56.1	70.9	62.9	
Wealth quintile																								
Richest	22.7	14.0	8.1	31.7	35.3	0.000	14.6	11.8	1.9	30.4	17.2	0.000	19.8	12.5	27.8	20.4	29.1	0.000	4.2	1.2	5.7	5.0	11.2	0.000
Richer	24.9	23.8	13.1	25.1	32.8		18.2	15.9	12.6	23.9	28.6		20.5	13.2	11.1	25.2	26.8		10.2	8.7	7.3	9.3	17.6	
Mediocre	20.4	20.4	20.2	20.9	19.6		13.3	11	6.3	21.5	20.7		22.6	26.3	22.2	20.4	20.1		19.0	16.2	8.1	25.9	15.7	
Poorer	19.7	24.0	32.3	16.0	9.8		15.4	15.8	14.6	10.6	26.6		23.9	31.3	19.4	22.2	15.6		34.3	34.9	19.5	35.7	35.1	
Poorest	12.3	17.8	26.3	6.3	2.5		38.5	45.5	64.7	13.6	6.9		13.2	16.7	19.4	11.9	8.4		32.3	39.0	59.3	24.0	20.4	
Family size																								
Small Families	10.2	14.3	14.1	6.3	5.4	0.004	13.1	14.3	12.4	10.7	13.7	0.000	8.5	8.5	13.9	6.7	10.1	0.009	9.8	8.8	14.5	14.1	1.3	0.000
Medium sized	24.7	22.8	21.2	26.8	27.5		20.6	17.9	25.0	25.2	15.9		16.4	18.9	25.0	15.6	12.3		14.6	12.1	11.3	16.2	19.8	
Larger Families	23.6	24.5	23.2	25.4	19.6		20.3	18.8	33.4	15.1	14.8		17.4	18.5	16.7	21.5	9.5		16.9	19.1	20.2	13.8	16.0	
Extended	41.4	38.5	41.4	41.5	47.5		45.9	48.9	29.2	49.0	55.5		57.7	54.1	44.4	56.3	68.2		58.7	60.0	54.0	55.9	62.9	
Dependency ratio																								
Up to 50%	21.4	22.1	18.2	25.1	16.2	0.007	16.2	14.3	16.5	16.3	25.6	0.000	15.5	16.4	11.1	13.0	19.0	0.226	14.5	18.5	7.3	14.5	5.1	0.000
51% -100%	30.9	32.8	33.3	24.7	34.3		38.8	38.3	34.9	42.6	39.9		34.9	33.5	44.4	35.2	34.6		33.4	30.1	40.3	34.4	38.0	
101%–<200%	20.9	20.4	10.1	23.3	23.5		21.4	18.9	32.5	20.7	15.2		24.9	22.4	13.9	29.6	24.0		31.8	27.8	40.3	31.0	42.5	
≥200	26.9	24.7	38.4	26.8	26.0		23.7	28.6	16.1	20.4	19.3		24.7	27.8	30.6	22.2	22.3		20.3	23.6	12.1	20.1	14.4	
Women's age																								
36-49	12.7	35.9	7.8	28.9	27.3		13.6	50.3	16.3	23.3	10		15.1	12.8	5.6	17.4	17.3		24.9	19.0	8.1	28.3	41.2	0.000
26-35	59.	38.7	8.8	31	21.5		51.6	49.8	15.9	25	9.3		47.3	40.6	50.0	48.9	54.7		44.7	44.	31.7	45.7	47.6	

	7																	8				
15-25	27.6	50.5	12.9	22.6	14		34.8	51.8	22.8	17.5	7.9		37.6	46.6	44.4	33.7	27.9		30.4	36.2	60.2	25.9	11.2	
Women's education																								
Highly Educated	16.6	28.6	4.8	42.3	24.4		11.7	45.5	7.1	32.3	15.2		12.0	9.6	13.9	13.0	14.0		3.4	2.1	1.6	5.3	2.9	
Secondary	28.3	34.6	5.9	32.9	26.6		19.6	40	7.8	33.4	18.7		16.7	12.1	22.2	18.9	19.6		6.6	4.5	0.8	9.5	8.6	
Primary	19.2	44.8	10.3	24.2	20.6		10.9	53.8	8.4	26.7	11.1		11.0	12.8	5.6	10.7	9.5	0.199	8.7	9.2	8.9	8.4	8.3	
Illiterate	35.9	51.5	14.9	20.7	12.9	0.000	57.8	54.5	26.1	15.4	4.0	0.000	60.3	65.5	58.3	57.4	57.0		81.4	84.2	88.7	76.8	80.2	0.000
Women's working status																								
Working	14.5	17.6	20.2	13.6	6.9	0.001	20.4	59.9	25.2	10.1	4.9	0.000	5.6	6.8	2.8	3.3	7.8	0.136	12.4	12.5	32.3	12.4	4.8	0.000
Not working	85.5	82.4	79.8	86.4	93.1		79.6	48.2	16.6	25.3	10		94.4	93.2	97.2	96.7	92.2		87.6	87.5	67.7	87.6	95.2	
Educated Women's working status																								
Highly Educated and working	2.3	1.2	1.0	4.5	2.5		0.9	0.8	0.5	1.0	2.7		2.6	1.8	2.8	0.7	6.7		.8	0.2	1.6	0.8	2.2	
Secondary Passed and Working	1.6	1.7	1.0	2.1	1.5		2.0	2.2	2.5	0.4	4.3		.7	0.7	2.8	0.4	0.6		1.3	0.5	3.2	2.6	0.3	
Primary Passed and Working	2.2	3.6	3.0	1.4	0.5	0.000	1.2	1.7	0.5	0.4	1.1	0.000	.5	0.4	2.8	0.4	0.6	0.004	.9	0.3	3.2	1.4	1.0	0.000
Illiterate and working	8.4	11.2	17.2	5.6	2.5		16.3	19.5	25.6	8.3	4.2		2.6	4.3	2.8	2.2	0.6		10.1	11.7	32.3	7.7	2.2	
Non-working	85.5	82.4	77.8	86.4	93.1		79.6	75.8	71	89.8	87.7		93.6	92.9	88.9	96.3	91.6		86.9	87.2	59.7	87.5	94.3	
Parity																								
Ideal	35.8	39.4	37.4	37.3	25.5		39.3	38.9	34.0	42.8	43.7		36.2	37.7	41.7	38.1	29.6		31.2	36.3	39.8	32.2	10.5	
less births	39.6	39.2	32.3	36.9	47.5	0.011	32.0	30.7	32.6	32.8	36.3		33.8	32.7	38.9	31.1	38.5		27.9	25.1	36.6	27.9	32.6	
more births	24.6	21.4	30.3	25.8	27.0		28.7	30.4	33.4	24.4	20.0	0.000	30.0	29.5	19.4	30.7	31.8	0.354	40.9	38.6	23.6	39.9	56.9	0.000

Husband's occupation																						
Professional /technical/ Managerial	13.4	8.8	7.1	18.8	18.1	0.000	10.2	7.9	4.5	17.9	15.1	0.000	17.2	14.6	16.7	15.9	23.5	0.004	16.3	12.0	13.7	21.7	17.8	0.000
Farmers	18.1	22.3	25.3	15.7	9.3		25.1	33.3	32.6	8.2	4.6		5.9	8.9	8.3	3.3	4.5		27.7	32.7	41.1	23.8	16.6	
Sales	14.0	10.7	12.1	15.7	19.6		13.5	12.0	4.5	21.8	19.9		14.0	9.6	11.1	15.6	19.0		13.4	11.3	1.6	16.4	17.2	
Services	6.1	7.1	1.0	5.2	7.8		4.9	5.9	1.8	4.5	6.7		8.1	10.7	16.7	5.2	6.7		3.8	5.7	7.3	1.1	2.9	
skilled labour	27.2	26.8	31.3	28.6	24.0		18.6	15.9	11.3	25.8	30.2		20.9	19.2	13.9	25.9	17.3		15.4	10.8	16.9	19.5	19.1	
unskilled labour	20.1	22.8	21.2	15.7	20.1	0.000	24.5	21.9	42.5	18.5	17.6		30.2	33.1	30.6	30.0	25.7		18.9	23.1	9.7	13.8	21.7	
Unemployed	1.1	1.4	2.0	0.3	1.0		3.3	3.0	2.6	3.3	5.9		3.8	3.9	2.8	4.1	3.4		4.5	4.4	9.7	3.6	4.8	
Husband's education																								
Highly Educated	18.4	14.7	6.1	24.7	23.0	0.000	24.0	20.0	12.9	36.8	38.0	0.000	23.4	17.8	22.2	28.5	24.6	0.011	15.2	13.7	8.1	14.8	23.3	0.000
Secondary	37.6	34.0	28.3	38.3	48.5		23.1	22.5	15.2	30.8	23.6		33.2	30.6	41.7	30.4	39.7		24.5	22.9	9.8	29.3	24.3	
Primary	20.3	21.4	26.3	18.5	17.6		19.2	22.2	18.9	14.2	15.1		14.4	14.9	11.1	14.1	14.5		8.5	9.2	13.0	7.8	6.1	
Illiterate	23.7	29.9	39.4	18.5	10.8		33.7	35.3	53.0	18.1	23.3		29.1	36.7	25.0	27.0	21.2		51.8	54.3	69.1	48.0	46.3	

Table 4: determinants of women's nutritional status (Punjab: DHS 2018)

	Punjab			Sindh			KPK			Balochistan		
Independent Variables	Under nutrition	Over Nutrition	Obesity	Under nutrition	Over nutrition	Obesity	Under nutrition	Over Nutrition	Obesity	Under nutrition	Over nutrition	Obesity
	AOR (Coeff)	AOR (Coeff)	AOR (Coeff)	AOR (Coeff)	AOR (Coeff)	AOR (Coeff)	AOR (Coeff)	AOR (Coeff)	AOR (Coeff)	AOR (Coeff)	AOR (Coeff)	AOR (Coeff)
Place of residence												
Urban	2.505 (.918)	1.407 (.341)	.781 (-.247)	.488 (-.717)	.952 (-.049)	2.489 (.912)	.216 (-1.530)	1.688 (.523)	3.431 (1.233)	3.066 (1.403)	.944 (-.058)	.901 (-.105)
Rural(Reference)												
Small Families	.585 (-.537)	.578 (-.548)	.803 (-.219)	1.196 (.179)	1.046 (.045)	.766 (-.267)	1.479 (.392)	.581 (-.543)	1.737 (.552)	1.152 (1.148)	3.140 (1.144)	.282 (-1.265)
Medium sized	.691 (-.370)	1.641 (.495)	1.608 (.475)	3.389 (1.221)	1.609 (.476)	.506 (-.680)	1.532 (.426)	1.309 (.269)	.991 (-.010)	1.657 (.505)	1.641 (.495)	3.371 (1.215)
Larger Families	.455 (-.787)	1.097 (.093)	.788 (-.238)	2.538 (.931)	1.074 (.072)	.966 (-.034)	.892 (-.114)	1.050 (.049)	.404 (-.906)	1.288 (1.190)	.690 (-.372)	1.204 (.185)
Extended(Reference)												
Wealth Status of the Households												
Richest	.253 (-1.373)	1.769 (1.753)	2.281 (3.010)	.293 (-1.229)	2.694 (2.040)	.577 (-.550)	1.464 (.902)	1.300 (.262)	1.070 (.728)	1.938 (1.371)	1.972 (1.787)	1.402 (2.735)
Richer	.296 (-1.216)	3.076 (1.124)	2.402 (2.241)	1.315 (.274)	3.771 (1.327)	1.168 (.156)	1.457 (.377)	1.471 (.386)	1.578 (.947)	.293 (-1.226)	1.216 (.196)	1.111 (1.414)
Mediocre	.559 (-.582)	2.765 (1.017)	2.442 (1.863)	.722 (-.326)	3.835 (1.576)	2.230 (.802)	1.188 (.172)	.945 (-.057)	1.294 (.258)	.340 (-1.080)	1.195 (.786)	.983 (-.017)
Poorer	.839 (-.176)	1.698 (.529)	2.029 (.708)	.963 (-.038)	1.732 (.549)	2.977 (1.788)	.329 (-1.112)	.798 (-.226)	.683 (-.381)	.330 (-1.108)	1.423 (.353)	1.544 (.434)
Poorest(Reference)												
Dependency Ratio												
Up to 50%	.419 (-.869)	.960 (-.041)	.517 (-.659)	3.273 (1.452)	1.871 (.626)	1.475 (1.245)	.390 (-.942)	1.196 (.179)	2.607 (.958)	.525 (-.645)	.782 (-.246)	1.292 (.256)
51% -100%	.562	.612	.735	1.213	1.087	1.026	1.414	1.736	1.743	1.317	1.170	1.656

	(-.576)	(-.490)	(-.308)	(1.167)	(.736)	(.706)	(.881)	(.551)	(.556)	(.840)	(.157)	(1.538)
101%–< 200 %	.339 (-1.080)	.765 (-.267)	.581 (-.542)	3.395 (1.222)	1.423 (.353)	1.453 (.373)	.141 (-1.957)	1.190 (.784)	1.697 (.529)	1.490 (.399)	1.610 (.476)	1.461 (1.495)
≥200 (Reference)												
Husband's education												
Highly Educated	.416 (-.878)	1.467 (.384)	1.254 (.227)	1.153 (.143)	1.843 (.612)	1.129 (.121)	.385 (-.953)	1.961 (1.086)	1.127 (.755)	.214 (-1.542)	.610 (-.494)	1.068 (.726)
Secondary	1.004 (.004)	1.340 (.292)	1.510 (.412)	.684 (-.379)	1.558 (.443)	.819 (-.200)	1.625 (.485)	1.252 (.225)	1.800 (.588)	.294 (-1.224)	1.178 (.164)	1.515 (.415)
Primary	1.485 (.395)	1.083 (.080)	1.308 (.268)	.707 (-.346)	1.022 (.022)	.940 (-.062)	.300 (-1.206)	1.889 (.636)	1.618 (.481)	1.918 (.651)	.919 (-.085)	1.035 (.035)
Illiterate(Reference)												
Husband's Occupation												
Professionals /technical/ Managerial	.757 (-.279)	1.634 (2.749)	.936 (-.066)	1.176 (.162)	1.364 (.310)	.809 (-.212)	.692 (-.368)	.752 (-.285)	2.297 (.831)	.393 (-.935)	1.977 (.682)	.433 (-.838)
Farmers	1.154 (.143)	1.129 (2.648)	.450 (-.799)	.908 (-.096)	.394 (-.932)	.146 (-1.925)	1.780 (.577)	.596 (-.517)	2.611 (.960)	.266 (-1.324)	.937 (-.065)	.342 (-1.072)
Sales	1.072 (.069)	1.089 (3.049)	1.147 (.137)	.687 (-.375)	1.532 (.426)	.748 (-.290)	.801 (-.222)	2.229 (.802)	3.307 (1.196)	.042 (-3.174)	1.368 (.314)	.666 (-.407)
Services	.145 (-1.928)	1.499 (2.442)	.639 (-.448)	.391 (-.939)	.439 (-.823)	.530 (-.635)	1.082 (1.805)	.338 (-1.086)	.921 (-.083)	.444 (-.811)	.171 (-1.767)	.301 (-1.201)
skilled labour	1.263 (.233)	1.752 (2.983)	.946 (-.056)	1.147 (-.823)	1.396 (.334)	1.016 (.016)	1.587 (.462)	.991 (-.009)	1.401 (.337)	.331 (-1.106)	2.420 (.884)	1.523 (.421)
unskilled labour	.870 (-.139)	1.826 (2.551)	.875 (-.134)	1.703 (.532)	1.309 (.269)	.529 (-.637)	2.081 (.733)	1.066 (.064)	2.352 (.855)	.142 (-1.954)	.625 (-.470)	.854 (-.158)
Unemployed(Reference)												
Women's age												
36-49 years	.685 (-.379)	1.804 (.590)	1.627 (.486)	.446 (-.807)	2.400 (.876)	2.972 (1.089)	1.271 (.240)	1.873 (1.055)	1.598 (1.280)	.238 (-1.437)	3.336 (1.205)	1.290 (1.456)
26-35 years	.555	1.571	1.280	.676	2.059	1.699	1.820	1.062	1.513	.359	2.083	2.914

	(-.589)	(.452)	(.247)	(-.391)	(.722)	(.530)	(.599)	(1.119)	(1.507)	(-1.024)	(.734)	(1.069)
15- 25 years(Reference)												
Women education												
Highly Educated	3.322 (1.200)	2.291 (.829)	1.458 (.377)	.739 (-.303)	.315 (-1.155)	3.068 (1.121)	3.794 (1.333)	1.054 (.053)	.838 (-.176)	.809 (-.212)	2.083 (.734)	.457 (-.782)
Secondary	1.281 (.248)	1.570 (.451)	1.444 (.367)	.808 (-.213)	.640 (-.447)	2.060 (1.401)	.807 (-.214)	1.393 (.331)	.933 (-.069)	.195 (-1.633)	2.560 (.940)	1.965 (.675)
Primary	.753 (-.283)	.849 (-.164)	1.169 (.156)	.446 (-.807)	.876 (-.132)	1.776 (.574)	.274 (-1.296)	1.209 (.190)	.770 (-.261)	1.327 (.283)	1.067 (.065)	.550 (-.597)
Illiterate(Reference)												
Women working status												
Working	.760 (-.274)	.891 (-.116)	.428 (-.848)	.825 (-.192)	.458 (-.781)	.638 (-.450)	.063 (-2.760)	.421 (-.864)	.588 (-.531)	1.571 (1.520)	1.104 (.099)	.411 (-.890)
Not working(Reference)												
Educated Women's working status												
Highly Educated and working	.282 (-1.266)	.779 (-.249)	.983 (-.017)	.879 (-.129)	.946 (-.056)	3.123 (1.139)	1.199 (.181)	1.481 (.393)	1.092 (2.572)	2.151 (2.527)	.783 (-.245)	1.382 (1.853)
Secondary Passed and Working	.254 (-1.372)	2.410 (.880)	.611 (-.493)	3.595 (1.280)	.083 (-2.493)	.516 (-.662)	2.937 (1.077)	.522 (-.650)	.501 (-.692)	2.593 (2.261)	4.437 (1.490)	.290 (-1.237)
Primary Passed and Working	.567 (-.568)	.262 (-1.340)	.147 (-1.916)	.397 (-.924)	.327 (-1.117)	.546 (-.605)	.749 (-.289)	.100 (-2.307)	.027 (-3.616)	3.491 (2.041)	3.841 (1.346)	2.288 (.828)
Illiterate and working	.890 (-.117)	.951 (-.050)	.343 (-1.069)	.887 (-.119)	.853 (-.159)	.690 (-.371)	.523 (-.649)	.387 (-.949)	.018 (-4.042)	3.701 (1.309)	.948 (-.054)	.235 (-1.449)
Not working (Reference)												
Total Births												
1-2 (Ideal)	.771 (-.261)	.682 (-.383)	.343 (-1.071)	.434 (-.835)	.571 (-.561)	.825 (-.193)	1.659 (.506)	1.164 (.152)	.552 (-.595)	1.215 (.195)	1.365 (.311)	.284 (-1.260)
3-4 (less births)	.805 (-.217)	.588 (-.531)	.572 (-.559)	.479 (-.737)	.724 (-.323)	1.364 (.310)	.733 (-.310)	.591 (-.527)	.473 (-.750)	2.280 (.824)	.936 (-.066)	.616 (-.484)
5 & above more births(Reference)												

AOR, Adjusted Odds Ratio(Coeff), Coefficient value in Parenthesis

4.2. DETERMINANTS OF DOUBLE BURDEN OF MALNUTRITION AMONG WOMEN OF FERTILE AGE

4.2.1. Bivariate analysis

The bivariate analysis in Table 3 examines whether households' , women's own or husband's characteristics were associated with DBM in each province in 2017–18 and whether those characteristics were statistically significant or not. Chi-square statistics has been employed to check the significance of the variables. Women living in Punjab's rural area were more undernourished but overweight and obesity among women were more prevalent in urban area. Similar trend has been observed in Sindh and KPK. However, women living in rural Balochistan were showed higher prevalence of both undernutrition and overnutrition. Undernutrition among women was more visible in Punjab's poorer and poorest households and overweight and obesity were more visible in women belonged to the richest and richer strata. Similar trend has been observed in Sindh except obesity that was more prevalent among women of richer, poorer and middle class households, on their socioeconomic scale. While malnutrition trends varied in other provinces. Undernutrition rates were greater among women of upper class, overweight was more prevalent among richer and poorer class and obesity was more prevalent in richest and richer households in KPK. However, in Balochistan, more undernourished women belonged to the poorest class and more overweight and obese women belonged to the poorer households. Malnutrition rates increased significantly with family size in all the provinces. All indicators of malnutrition among women were just moved around the highly dependent and households having 51% -100% dependency ratio for all provinces. Undernutrition was significantly higher among women aged (15-25) years in Punjab, Sindh and Balochistan. While overweight and obesity were higher among older women. Whereas in KPK, both undernutrition and overnutrition were greater among women aged (26-35) followed by women aged (15-25) years. Low BMI was observed among uneducated women in all the 4 provinces, while overnutrition problem lie among the well educated women only between Punjab and Sindh. On the contrary, excess BMI subsisted among uneducated women between both KPK and Balochistan. Non-working women faced the undernutrition and overnutrition problem more, in Punjab, KPK and Balochistan. However, undernutrition rates were higher among working women and overnutrition rates were higher among non-working women in Sindh. Similarly, in case of interaction term, non-working women have the highest undernutrition and overnutrition rates in all the 4 provinces. Undernutrition and overnutrition both problems mainly occurred among women with less births in Punjab, Sindh and KPK. While this situation was inverse in case of Balochistan. Although undernutrition was present among women with less births yet overnutrition rates were more prevalent among women with more births. As far as husband's profession was concerned, all indicators of malnutrition rates were high among those whose spouses engaged in skilled labour in Punjab and among unskilled labour in KPK. While undernutrition rates were higher among unskilled labour and overnutrition rates were higher among skilled labour in Sindh. Whereas undernutrition and overweight prevalence were higher among skilled labour and obesity prevalence were higher among unskilled labour in Balochistan. Similarly, undernutrition problem was in greater percentage among uneducated husbands in all the provinces except KPK. While wives of secondary passed husbands have greater chances of being overweight and obese in Sindh. Likewise, wives of highly educated husbands have greater chances of being overweight and obese in Punjab. Women of KPK and Balochistan were facing more undernutrition as well as overnutrition problem whose spouse were secondary passed and illiterate respectively. Disparities in malnutrition rates by urban/rural residence, wealth, parity, women's education, husband's education and profession were greater in Balochistan than in other provinces.

5. DISCUSSION

The PDHS surveys reveal substantial provincial differences in all indicators of maternal malnutrition. Women living in urban locations in Punjab and Balochistan were more likely to be undernourished and less likely to be obese as compared to rural women. This showed more undernourishment and lower BMI ratios among women of urban areas of both provinces. However, in case of overweight, women of Punjab were more inclined and women of Balochistan were less inclined to have overweight problem. While women of urban Sindh and KPK were less likely to be underweight and more likely to be obese than their rural counterparts. Nevertheless urban women belonging to KPK have a greater likelihood of being overweight and urban women of Sindh have less likelihood of being overweight than rural dwellers. A huge Urban/rural disparity is apparent among provinces of Pakistan. These findings are also in line with the reports of National nutrition survey (2018) that at provincial level, Balochistan have more undernourished women while overweight and obesity were more pronounced in KPK (UNICEF, 2018). Another study also estimated that obesity is higher in urban areas as compared to rural areas (Siddiqui et al. 2018).

Family size was proved to be a significant predictor of women malnutrition in Punjab as small family size expressing lower family burden as compared to the reference category (overcrowded) showed lower odds of association with undernutrition as well as overnutrition problem among women of reproductive age. However, in

case of Sindh, family size was not verified to be a significant predictor of women undernourishment and fatness. However, in case of obesity medium sized and larger households have lower chances to have obese women as compared to overcrowded households. While in KPK, women of larger families showed lower odds of association with undernutrition than overcrowded families. Likewise, women of small families have lower tendency of being overweight. Women of medium sized and larger families were less inclined to be obese than women of overcrowded families. However, in case of Balochistan**,** larger families showed lower odds of association with overweight among women of reproductive age as compared to overcrowded families. Similarly, women of smaller families were less likely to be obese than overcrowded households.

Socioeconomic class of the households was also verified as a key driver of women undernutriiton status. Women of almost all tertiles of social class belonging to Punjab, Sindh and Balochistan, showed lower tendency to be undernourished as compared to women of poorest families. Usually most times, poor families were unable to purchase enough nutritious food for themselves and for their family. Many studies accuse poverty due to low economic access, as the chief and principal cause as well as consequence of undernourishment among women (Vorster; 2010), (Tanumihardjo et al; 2007). There should be insertion of nutrition interventions in poverty mitigation programs to break the vicious cycle of poverty and malnutrition. Some researchers also considers improvement and investment in human capital as the only remedy to generate incomes through increasing productivity and lift the individuals to jump out of poverty trap (Dao; 2008) , (Horrell et al; 2001). On the contrary the prevalence of overweight and obesity was found to be higher among women from the highest social class than those reared in the lowest class with respect to Punjab, Sindh and Balochistan. It destined that overweight and obesity, regardless of "its genetic and biochemical determinants," is also potentially "susceptible to an extraordinary degree of control by social factors. In developing countries, SES was positively (and strongly) related to overweight and obesity in women and was seen as a sign of health and wealth (Karasu, 2018). Two other studies also concluded that women of upper social class were more overweight and obese due to ease of access to food, minimal physical activity and because of globalization of processed and fast food (Waghmare et al. 2022) ., (Siddiqui et al. 2018). While in case of KPK remarkably only women of poorer families are less likely to be undernourished and overnourished as compared to the poorest households. In addition to this women of middle class families also have lower chance of being overweight.

Age dependency ratio is also testified as a potential confounder of both, undernutrition as well as overnutrition status of women in Punjab. Whereas in Sindh, least dependent households were more likely to have undernourished and overnourished women. In case of Balochistan, household with lowest age dependency ratio were less likely to have underweight and overweight women and more likely to have obese women as compared to highly dependent households. While with respect to KPK, Age dependency ratio (up to 50 %) and (101 %–< 200 %) show lower odds of association with women undernutrition status as compared to the highly dependent households.

Educational level of husband acts as a marker of social status of their spouses. It has a greater effect on the health status and lifestyles of their wives and determines the family position on the social scale in view of his income and prestige. Highly educated husbands belonged to Punjab and KPK, were less likely to have undernourished wives than uneducated husbands. A study by Lipowicz, (2003) also has the same results. However, it showed greater odds of association with their spouse overnutriiton status. Brown et al. (2014) did not find any evidence that husbands' education mattered for their wives' health risk Regarding Sindh, secondary and primary passed husbands were less likely to have undernourished and obese women than uneducated husbands. The findings about Balochistan, highlighted a non-monetary benefit of education, serves as the most effective tool to prevent malnutrition (Tran et al, 2021) in Pakistan. Highly educated husbands show lower tendency towards undernutrition as well as overweight problem among women as compared to uneducated husbands.

Husband's engaged in services, unskilled labour and served as professionals were less inclined to have undernourished wives than unemployed husbands in Punjab. While employed husbands showed greater odds of association with women's fatness and lower odds of association with obesity. Whereas in Sindh, husbands engaged in farming and services were less likely to have undernourished and overweight wives as compared to unemployed husbands. Concerning obesity, husbands engaged almost in any profession show lower odds of association as compared to unemployed husbands. Similarly, regarding KPK, professionals and people engaged in sales show lower chances to have undernourished wives than unemployed people. Almost all the categories of husbands 'profession are less likely to have overweight prevalence among women. As far as obesity is concerned, husband only engaged in services showed 0.921 times lower likelihood of women obesity than unemployed husbands'. In Balochistan, husband's occupation was also verified to be a potential confounder of their wives malnutrition status and more or less all professionals and non-professionals were less inclined to have malnourished wives.

The study also witnessed significant association between women's own characteristics and their nutritional status such as women's age. The risk of undernutrition in Punjab, Sindh and Balochistan for women aged (26- 49) years

were lower as compared to women aged (15-25) years. However, in case of overweight and obesity, women of the same age group were more likely to be malnourished. Nevertheless regarding KPK women's age is not proved to be a significant predictor of her own undernutrition status. Notably, women's age affects the entire sample of the four provinces in the same direction in case of overnutrition. Various published literature has explained that increasing the women's age is one of the main risk factors for women's poor nutritional status (Waghmare et al. 2022). Asif et al. (2020) estimated that overweight prevalence was highest for women in the (35–44) age group. Khan et al. (2017) showed a significantly higher prevalence of obesity among those who were 45 years of age or older. Such associations have been reported by various studies across the world including Asia and South Asia. Another study by Zakria & Ashraf (2014) analysed that BMI decreased with women's age. All the above mentioned studies are based on Pakistani data. Gaba & Pridalova (2014) were also of the view that age-related changes also include changes in body composition; associated with obesity.

Primary passed women show lower tendency towards leanness and overweight than uneducated women in Punjab. Whereas Women's education in Sindh, was also analysed to be a key driver of women undernutrition and overweight statuses. Highly educated and secondary passed women were less inclined to be underweight. Similarly, highly educated and primary passed women showed lower chances of being obese. Regarding KPK, secondary and primary passed women were less likely to have undernutrition problem as compared to illiterate women. Similarly, educated women were less likely to experience obesity than uneducated women. All this showed a major effect of women's education on many non-monetary outcomes, such as their health and wellbeing (Tran et al. 2021). Although the findings highlighted that education is a determining factor to balance their body weight, yet in some cases, women with a high or adequate level of education do not have sufficient knowledge about nutrition and therefore unable to fight the battle against malnutrition (Guevara-Romero et al., 2021; Mahmudiono et al. 2018).

The findings also revealed that women's working status as a key driver for attaining maternal nutritional goals in Punjab and Sindh and KPK. Working women were less inclined to have undernutriiton and overnutrition incidence as compared to non-working women. While this was only true in case of obesity in Balochistan.

Correspondingly, the combined effect of women's education and working was also proved to be a strong predicator of women's undernutrition and overnutrition status in Punjab and Sindh. Regarding KPK, secondary passed working ladies showed lower likelihood of being overweight and obese than nonworking ladies. Similarly, primary passed and illiterate working women showed lower odds of association with undernutrition and overnutrition as compared to non-working women. While in Balochistan, educated and work showed lower likelihood of overweight problem among women in case of highly educated and illiterate working women. Likewise, secondary passed and uneducated women show lower odds of association with obesity as compared to non-working women.

Moreover, women with fewer births also showed lower manifestations of undernutrition and overnutrition as compared to women with many births in Punjab and Sindh. While in KPK, women having one or two children showed lower odds of being obese than women with many births. Correspondingly women with fewer births are less likely to be undernourished and overnourished as compared to women with many births. Regarding Balochistan, women having at most four children were less likely to be obese than women having many children. Women having three or four births were less likely to be overweight than women having many births. The most striking result was that women with fewer births were more likely to be undernourished than the reference category. It seems women of Balochistan were strong enough to give births to many children without becoming undernourished.

6. LIMITATIONS

The current study had a number of strengths and limitations. By examining women's health status at the provincial level, this study is helping to fill a gap in the literature. The reliable estimates about maternal health key indicators as provided by PDHS make it possible to permit comparisons at provincial level and show trends over time. However,, the analysis does have some limitations. PDHS questionnaires did not collect information about many factors that have proven relevant in other research, such as the food availability and expenditure, physical activities, and nutrient deficiencies.

7. CONCLUSION

The problem of being underweight and overweight/obesity still exists among the women of reproductive age in Pakistan. Although some strategies to reduce double burden of malnutrition among women are pertinent nationwide, public health managers need to seek solutions specific to provincial trends and predictors. Several factors associated with DBM were identified such as urban/rural, wealth index, women's age, education, women working status, educated women working status, parity etc., however,, the results were not homogeneous within the provinces.

The problem of DBM mainly affects developing countries, presently undergoing a nutrition transition. This transition is ascribed to changes in dietary patterns manifested by greater availability of commercialized foods such

as refined sugars and flours and processed foods items at global level. Pakistan is a country highly passionate about its food. On average Pakistani cuisine comprises of three main meals; breakfast, lunch, dinner and much more between them. Their diets are usually nutrient dense, having a higher percentage of saturated fats, trans-unsaturated fatty acids and added sugars, resulting in high calories consumption. Due to the rapid urbanization, modernization and rise in the price of staple food, the intake of fats and sugar increased steadily. Use of junk food, fast food, processed food and carbonated drinks are getting very trendy in the younger generation. All this leads to constructive high fat diet instead of traditional low-fat diet and escalating the risk of having overweight and obesity among women of WRA.

7.1. RECOMMENDATIONS

The analysis demonstrates that focusing on family structure, husband's education and profession women's age, education and working status, wealth index, parity and different public health intervention approaches are imperative to reduce unhealthy weight conditions among WRA.

Not only the degree of socioeconomic inequality in DBM but also its pattern should be of concern in setting health policies. There is also a need for increased nutrition education and behaviour change communication and also indicate the possibility of having healthy diets in urban settings. Previous studies have linked DBM rates among women in Pakistan mainly with women's age, education, socioeconomic status and urban /rural difference. This study identified many other risk factors such as family structure, number of earners/dependents in a household setting, number of children bore by a women, husband's education and profession, women working status and educated women working status in Punjab, Sindh, KPK and Balochistan, confirms that these may pose a problem. Economically active population may lead to increase the socioeconomic status of the households and indirectly affects women's health. Improvement should be made to provide access to safe water, sanitation and hygiene to people living in remote areas to enhance their socioeconomic status and food absorption. Empower women through employment as more empowered women desire fewer children and had more access and control to health services and health resources. Husband's as key decision-makers in households, play a vital role in determining their wives' access to health services. Therefore husband's education and knowledge and their employment status is very important.

Therefore viewing women's health in Pakistan through a provincial lens can help to achieve a deeper understanding of the challenges and potential strategies to overcome women's malnutrition. These differences signify a call for more comprehensive and harmonized data collection that would permit a comparison of the DBM across provinces and geographies, as well as providing targeted recommendations for each province and region where the prevalence of malnutrition among WRA remains high.

Last but not the least Pakistani government faces huge fiscal challenges to wholly accomplish the SGDs related to health and nutrition. According to an IMF report (2021), an additional amount of 16pc of GDP will be required annually until 2030 from the public and private sectors combined to help to achieve these SGDs.

REFERENCES

Anik, A. I., Rahman, M. M., Rahman, M. M., Tareque, M. I., Khan, M. N., & Alam, M. M. (2019). Double burden of malnutrition at household level: A comparative study among Bangladesh, Nepal, Pakistan, and Myanmar. *PloS one*, *14*(8), e0221274.

Asghar, Z., & Muhammad, A. (2013). Socio-economic determinants of household food insecurity in Pakistan.

Asif, M., Aslam, M., Altaf, S., Atif, S., & Majid, A. (2020). Prevalence and sociodemographic factors of overweight and obesity among Pakistani adults. *Journal of obesity & metabolic syndrome*, *29*(1), 58.

Black, R. E., Victora, C. G., Walker, S. P., Bhutta, Z. A., Christian, P., De Onis, M., ... & Maternal and Child Nutrition Study Group. (2013). Maternal and child undernutrition and overweight in low-income and middle-income countries. *The lancet*, *382*(9890), 427-451.

Brown, D. C., Hummer, R. A., & Hayward, M. D. (2014). The importance of spousal education for the self-rated health of married adults in the United States. *Population research and policy review*, *33*(1), 127-151.

Cecchini, M., & Vuik, S. (2019). The heavy burden of obesity. https://www.oecd.org/health/the-heavy-burden-of-obesity-67450d67-en.htm

Crear-Perry, J., Correa-de-Araujo, R., Lewis Johnson, T., McLemore, M. R., Neilson, E., & Wallace, M. (2021). Social and structural determinants of health inequities in maternal health. *Journal of women's health*, *30*(2), 230-235.

de Romana, D. L., Greig, A., Thompson, A., & Arabi, M. (2021). Successful delivery of nutrition programs and the sustainable development goals. *Current Opinion in Biotechnology*, *70*, 97-107.

Gaba, A., & Přidalová, M. (2014). Age-related changes in body composition in a sample of Czech women aged 18–89 years: a cross-sectional study. *European journal of nutrition*, *53*(1), 167-176.

Grosso, G., Mateo, A., Rangelov, N., Buzeti, T., & Birt, C. (2020). Nutrition in the context of the Sustainable Development Goals. *European journal of public health*, *30*(Supplement_1), i19-i23.

Guevara-Romero, E., Flórez-García, V., Egede, L. E., & Yan, A. (2022). Factors associated with the double burden of malnutrition at the household level: A scoping review. *Critical Reviews in Food Science and Nutrition*, *62*(25), 6961-6972.

Habib, K., Shafiq, M., Afshan, G., & Qamar, F. (2019). Impact of education and employment on women empowerment. *European Online Journal of Natural and Social Sciences: Proceedings*, *8*(3 (s)), pp-62.

Hanif, M., Khalid, S., Rasul, A., & Mahmood, K. (2021). Maternal mortality in rural areas of Pakistan: challenges and prospects. *Rural Heal*, *27*, 1040-1047.

Heath, R., & Jayachandran, S. (2016). *The causes and consequences of increased female education and labor force participation in developing countries* (No. w22766). National Bureau of Economic Research.

Khan, I., Ul-Haq, Z., Taj, A. S., Iqbal, A. Z., Basharat, S., & Shah, B. H. (2017). Prevalence and association of obesity with self-reported comorbidity: a cross-sectional study of 1321 adult participants in Lasbela, Balochistan. BioMed Research International, 2017.

Kiani, Khaleeq. (2022, 30 September). Modest progress on SDGs. The Dawn: https://www.dawn.com/news/1686708

Kim, R., Kawachi, I., Coull, B. A., & Subramanian, S. V. (2018). Contribution of socioeconomic factors to the variation in body-mass index in 58 low-income and middle-income countries: an econometric analysis of multilevel data. *The Lancet Global Health*, *6*(7), e777-e786.

Mahmudiono, T., Al Mamun, A., Nindya, T. S., Andrias, D. R., Megatsari, H., & Rosenkranz, R. R. (2018). The effectiveness of nutrition education for overweight/obese mother with stunted children (NEO-MOM) in reducing the double burden of malnutrition. Nutrients. 2018; 10 (12): 1–16.

Murira, Z., & Torlesse, H. (2020). Improving maternal nutrition in South Asia: Implications for child wasting prevention efforts. *Field Exchange 63*, 92.

Norman, K., Haß, U., & Pirlich, M. (2021). Malnutrition in older adults—recent advances and remaining challenges. *Nutrients*, *13*(8), 2764.

Nugent, R., Levin, C., Hale, J., & Hutchinson, B. (2020). Economic effects of the double burden of malnutrition. *The Lancet*, *395*(10218), 156-164.

Siddiqui, M., Hameed, R., Nadeem, M., Mohammad, T., Simbak, N., Latif, A., ... & Baig, A. (2018). Obesity in Pakistan; current and future perceptions. *J Curr Trends Biomed Eng Biosci*, *17*, 001-004.

Song, J., Zhang, J., Fawzi, W., & Huang, Y. (2020). Double burden of malnutrition among Chinese women of reproductive age and their social determinants. *Nutrients*, *12*(10), 3102.

Sserwanja, Q., Mukunya, D., Habumugisha, T., Mutisya, L. M., Tuke, R., & Olal, E. (2020). Factors associated with undernutrition among 20 to 49 year old women in Uganda: a secondary analysis of the Uganda demographic health survey 2016. *BMC Public Health*, *20*(1), 1-10.

Tran, D. B., Pham, T. D. N., & Nguyen, T. T. (2021). The influence of education on women's well-being: Evidence from Australia. *Plos one*, *16*(3), e0247765.

UNICEF. (2018). Pakistan National Nutrition Survey 2018: Key Findings Report. *UNICEF: Islamabad, Pakistan*.

Vagsholm, I., Arzoomand, N. S., & Boqvist, S. (2020). Food security, safety, and sustainability—getting the trade-offs right. *Frontiers in Sustainable Food Systems*, *4*, 16.

Waghmare, H., Chauhan, S., & Sharma, S. K. (2022). Prevalence and determinants of nutritional status among women and children in Pakistan. *BMC Public Health*, *22*(1), 1-13.

World Health Organization. (2020). The double burden of malnutrition: policy brief Geneva: World Health Organization; 2017.

World Health Organization. The double burden of malnutrition: policy brief. Geneva: World Health organization. 2016.

Zakria, M., & Ashraf, M. (2014). Factors affecting on obesity and underweight with outcome among people living in the vicinity of Marzipura, Faisalabad. *The Professional Medical Journal*, *21*(05), 1063-1069.

Zhou, D., Shah, T., Ali, S., Ahmad, W., Din, I. U., & Ilyas, A. (2019). Factors affecting household food security in rural northern hinterland of Pakistan. *Journal of the Saudi Society of Agricultural Sciences*, *18*(2), 201-210.