

The Combined Effect of Empowerment and Wealth on the Women's Nutritional Status in Egypt

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Abstract: Three-quarters or more of Egyptian women suffer from obesity or overweight, a matter that reflects their poor nutritional status. This study aimed to answer a specific question: Are there any significant differences in the body mass index degrees between the categories of the variable that classifies women according to both wealth and empowerment together? If any, are the different levels of women's empowerment affected by their wealth status and vice versa, regarding Egyptian women in their childbearing years? Using cluster analysis, the women were classified into six groups. To determine whether there were differences in BMI scores among the groups resulting from the classification, the Kruskal-Wallis test was used. Points of difference were identified by multiple comparisons. The results showed strong significant differences in BMI scores among the six groups resulting from the classification. The nutritional status of the woman with a certain level of empowerment was not affected by whether she belonged to a poor family or not. Moreover, the same status of the woman who belongs to a non-poor family was not affected by her empowerment level, while that of the woman who belongs to a poor family was affected by it. This study strongly demonstrates that high levels of empowerment for women who belong to poor families ensure that their nutritional status is not affected by their household wealth status. Therefore, empowering women in the family and combining it with awareness of the proper nutritional path is the key to advancing women's nutritional status in Egypt, where nearly half of the population suffers from poverty.

Keywords: The combined effect; household empowerment; Body Mass Index; women nutrition; household wealth; Egypt.

1. Introduction

Recently the population of Egypt exceeded 103 million [1]. Women in the reproductive age are at 25% of the total population [2]. In terms of the most obese population, Egypt ranks seventh in the world and first in the Arab World [3]. On the internal level, according to the "100 Million Seha" initiative, approved by the President Abdel Fattah Al-Sisi in 2019 to support the health of Egyptian women, 49.7 million Egyptians aged 18 and above were examined. 39.8% of those examined were overweight or obese [4]. The percentage is higher among women than men, almost double "50.3% against 26.4%" [5] [6]. During the survey period (2000-2014), it was found that three-quarters or more of Egyptian women are obese or overweight [7].

This reflects the poor nutritional status of most Egyptian women and its serious repercussions on various family, health, social, and economic levels. Obesity tops the cause list of most diseases, including type 2 diabetes [8, 9, 10, 11]. [4] showed that nearly three-quarters of the type 2 diabetes cases in Egypt are due to obesity. Other diseases that obesity causes include hypertension [11], fatty liver [12, 13, 14], osteoporosis and arthritis [15, 16, 17, 18], arterial stiffness [19], cardiovascular disease [20, 21, 22, 23, 24, 25], polycystic ovary syndrome [26, 27, 28], stroke; obstructive apnea; hyperlipidemia [4], damage to all methods of contraception [29], fertility [29, 30], preeclampsia [31, 32], anemia [33, 34, 35, 36], depression [37], one of the risk factors when infected by Corona virus [38, 39, 40], and death [41, 42, 43]. Obesity can also cause many types of cancers (about 40% of all cancers) [44, 45], such as colon, rectum, pancreas, stomach and esophagus cancer [24], breast and endometrial cancer [46, 47], thyroid, kidney, liver, and ovarian cancer [48] [45].

Obese people are also exposed to bullying [49, 50, 51] and difficulties in employment. Obesity can be an indirect reason for divorce since it can cause infertility [52] and spinsterhood [53]. In addition, it leads to the economic losses incurred by Egypt to treat obesity-related problems, which amounted to 62 billion EGP in 2020 [29]. Moreover, obesity has an impact

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on the productive capacity of citizens which negatively impacts the basics of the Egyptian economy [3]. Given the direct and indirect risk of obesity or overweight, studies sought to search for its determinants and causes. Some studies attributed those causes to some factors, such as mental state and depression [29], environmental factors, genetic susceptibility, reduced physical activity [54, 55], lack of awareness of nutritional healthy diets and unhealthy lifestyle [53], food consumption patterns [56], education levels and their relationship to nutritional diets [57], cultural factors, the role of mass media and social media in promoting high-calorie fast food, and the popular lifestyle in Egypt which lacks physical activity [3].

Many studies in different countries dealt with women's nutrition and empowerment. A study in South Asia indicated that women's empowerment helps researchers understand women's and their families' nutritional status [58]. [59] in Bangladesh provided evidence of an association between poor maternal nutrition, low empowerment, and low birthweight babies. [60] in India provided evidence that women's low nutritional status improves with enhanced levels of agriculture empowerment. On the other hand, the World Health Organization indicated an association between poverty and obesity in Egypt [53]. In Bangladesh, a significant correlation was also found by [61] between the wealth index and the status of women who suffer from being underweight, overweight, or obese.

Some of the researchers recommended that those interested in studying women's nutrition and empowerment in the future must take into consideration their wealth status [59]. Therefore, this paper focused on the role that empowerment and household wealth play in nutritional status.

2. Objectives

This paper mainly aimed to study the combined effect of empowerment and wealth on women's nutrition status. To achieve this goal, there are two specific questions:

1. Are there any significant differences in the body mass index degrees, which expresses the women's nutritional status, among the categories of the variable that classifies women according to wealth and empowerment together?
2. And if any, are the different levels of women's empowerment affected by the wealth status and vice versa, with regard to the nutritional status of Egyptian women in their childbearing years?

3. Data Source

The sample used in the study's statistical analysis was obtained from the Egypt Demographic and Health Survey (EDHS) [7]. All of Egypt's governorates are covered in this survey except parts of Sinai Governorate (North and South). Previously married women in their childbearing years (15-49) in the survey were 21,762. Only 20,430 currently married women were retained. The cases of women who were excluded from the study were pregnant, those who gave birth within less than two months, and the missing values. Thus, only 19,021 women were included in the statistical analysis.

4. Literature Review

Factors associated with women's nutrition have been examined through numerous studies. As the current study relates to the combined effect of wealth and empowerment, it turns out from reviewing the literature that studies on this aspect are rare, with few interested in studying the effect of empowerment and wealth status, each independently on the women's nutritional status [62]. Thus, three types of studies can be referred to below:

Studies on women's nutrition in the light of wealth and empowerment

An East African study on empowerment and child nutrition concluded that the impact of empowerment on children's nutritional status (which improves as their mother's nutrition improves) changed with changes in wealth status [63]. In this same aspect, a Bengali study indicated the role that household wealth plays in changing the empowerment effect on the mother's nutritional status [59].

Studies on women's nutrition and empowerment

An East African study [62], another in six countries in Asia and Africa [64], and a third in Pakistan [65] found a positive correlation between women's empowerment and their nutritional status, expressed by body mass index. On the other hand, a study in rural India about women's nutritional empowerment showed that it is a strong predictor of diets for both men and women at lower income levels, and emphasized the value of investing in empowerment nutrition channels for improving nutritional outcomes for both women and men [66].

Studies on women's nutrition and wealth

The results of a study in Nairobi, Kenya showed a strong positive relationship between wealth and Body Mass Index [67]. A study in Uganda also indicated that women with better household wealth status are more likely to be obese or overweight [68]. In a study in Bangladesh, wealth was significantly associated with different weights [61]. Moreover, the results of a study in Pakistan found that household wealth is one of the most serious factors causing poor women’s nutrition [69].

In light of the above, it is evident that empowerment and household wealth have a very important impact on women's nutritional status, and it is necessary to study their combined effects to show other dimensions.

5. Conceptual Framework

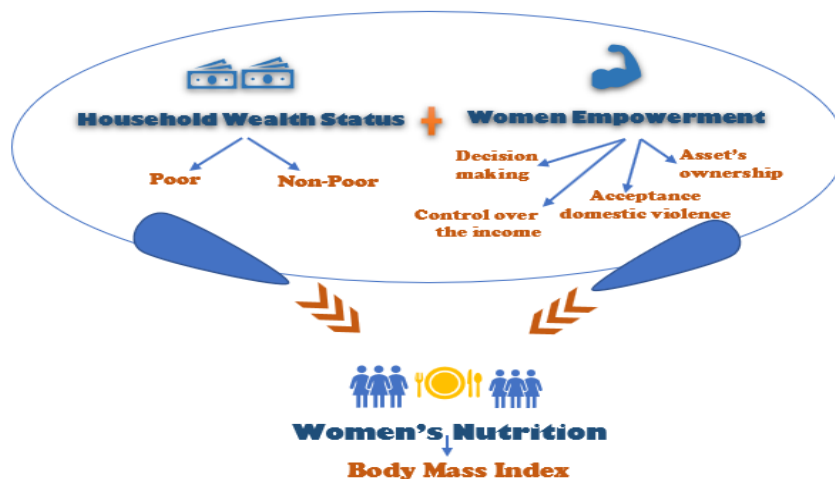


Fig. 1. The Relational Framework for the Study Variables

Source: Proposed by the researcher

6. Methodology

6.1 Description of Variables

Dependent Variable

Body Mass Index (BMI). In this study, the women's nutritional status was studied through the body mass index variable, which is calculated by the following formula: $\text{weight} \div \text{height}^2$; (kilograms/meters). The following are the score limits for the women’s nutritional status: ≤ 18.4 (Thin); 18.5-24.9 (Normal weight); ≥ 25 (Total obese or overweight) [7]. Overweight and obesity can be defined as an increase in body fat above the normal rate [70].

Independent variables

The First Index: The Women's Household Empowerment. This index consisted of four main items, each consisting of several sub-items as shown in figure (1). Through those items, the answers to 12 questions/items were collected into a new variable (to find out how those variables were encoded, refer to the “Description of Variables” section of the reference [71]). Then, an average was calculated for each woman by dividing her score in that variable by the number of questions/sub-items. The median, Q1 (the first quartile), and Q3 (the third quartile) were then calculated. Through these calculations, the degrees of this variable were divided into three levels (high - medium - low), as follows: ($\leq Q1$ =Low), ($> Q1 - \leq Q3$ =Medium), ($> Q3$ =High).

The Second Index: The Household Wealth. This index composed of two categories only: “poor” and “non-poor”. However, in EDHS, it composed of five categories combined into the previous two categories: (poor = Poor + very poor) (non-poor = medium + rich + very rich).

6.2 Data analysis

The sample under study was described using some methods of data description. Cluster Analysis was used to classify the women sample in terms of both the level of their empowerment and the status of household wealth. Since the body mass index (BMI) variable data are unnaturally distributed, some nonparametric methods were used, such as the Kruskal-Wallis test for multiple comparisons, in order to find out whether there are significant differences or not in the BMI scores among the categories of the variable that classifies women in terms of both empowerment and wealth. This was followed by using

Dunn's test to find out if there were significant differences in BMI scores between every two categories of the classification variable to determine where the differences were. Significance was defined as $*P < 0.05$. The analysis of this study was carried out using SPSS-24.

7. Analysis and Results

7.1 Description of the Sample

The numbers presented in figure (2) confirm the existence of a major problem in the nutritional status of Egyptian women, as most of the women in the study suffer from overweight or obesity (85%), and the percentage of the women with normal weight is small (much less than a quarter 15%).



Fig. 2. women's proportional distribution according to BMI

7.2 Cluster Analysis Results

The classification of women according to both the empowerment and wealth variables using the cluster analysis resulted in six groups with a 'good' classification quality score of 1 (1=good) as shown in Figure (3). All taxonomic categories had only one empowerment level and one wealth status.

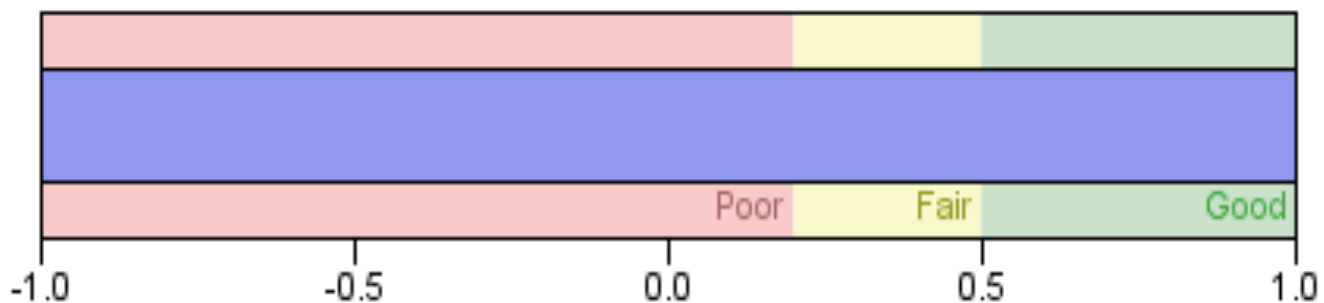


Fig. 3. Cluster Quality

Table (1) displays the contribution percentages of empowerment and household wealth in each of the six categories of the classification variable. By examining the percentages of women's distribution in the six classification categories, it is noticed that the highest percentage was for the non-poor women with a high level of empowerment (35.8%), and the lowest percentage was for those who have a low level of empowerment and belong to non-poor families (7.6%). As for the women who have low empowerment and belong to poor families, their percentage reached 13.5%.

Table 1: The six categories resulting from the classification using cluster analysis and the relative distribution of women according to them, and the relative distribution of both empowerment and wealth categories according to the classification categories.

Cluster	Empowerment Index			Wealth Index		Cluster Number	
	Low %	Medium %	High %	Non-Poor %	Poor %	Frequency	%
High and Non-Poor			78.3	56.2		5936	35.8
High and Poor			21.7		27.3	1642	9.9

Medium and Non-Poor		61.2		31.9		3367	20.3
Medium and Poor		38.8			35.5	2136	12.9
Low and Non-Poor	35.9			11.9		1256	7.6
Low and Poor	64.1				37.3	2244	13.5
Total	100	100	100	100	100	16581	100

7.3 Kruskal-Wallis Test

The test results indicated that the BMI scores were significantly different among the six categories of the new categorical variable resulting from the Cluster Analysis (Kruskal-Wallis = 41.552; df=5; p = .000; n=16581).

7.4 Pairwise Comparisons

Comparisons between the same level of empowerment with different wealth status

Table (2) presents the results of the Pairwise Comparisons, which showed no significant differences in the BMI scores for comparisons of the women who have the same level of empowerment but are different in terms of wealth status. This is the case in all levels of empowerment.

Comparisons between the same wealth status with different levels of empowerment

The results showed significant differences in BMI scores between the women who belong to poor families and have a low level of empowerment as compared to the women of the same wealth status who have a high level of empowerment ($z = -4.307$; $p = .000$). On the other hand, those significant differences in scores did not appear among the rest of the comparisons of the women who have the same wealth status but are different in terms of the level of empowerment.

Comparisons between different levels of empowerment and different wealth status

In those comparisons, significant differences appear between the category of women who belong to poor families and have a low level of empowerment and those who belong to non-poor families and have a high level of empowerment ($z = 5.572$; $p = .000$), and women who belong to non-poor families and have a medium level of empowerment ($z = 5.395$; $p = .000$).

8. Discussion

The nature of the classification of the women under study, which combines empowerment and household wealth, has shown through statistical tests that the significant differences in nutritional status did not appear among the women who have the same level of empowerment but are different in terms of wealth status. As for those who have the same wealth status but are different in terms of the level of empowerment, significant differences in nutritional status appeared among women who belong to poor families and not the non-poor.

This means that the nutritional status of the women, who have a certain level of empowerment, is not affected by whether these women belong to poor or non-poor families. Moreover, the nutritional status of the women who belong to non-poor families is not affected by the level of their empowerment. On the contrary, the nutritional status of the women who belong to poor families may be affected by their level of empowerment.

Table 2: Pairwise Comparisons Results

Classification variable classes	High and Non-poor	High and Poor	Medium and Non-poor	Medium and Poor	Low and Non-poor
High and Poor	Z = - .065 P = 1.000				
Medium and Non-poor	Z = .414 P = 1.000	Z = .237 P = 1.000			
Medium and Poor	Z = 2.539 P = .167	Z = - 2.007 P = .671	Z = 2.936 P = .125		
Low and Non-poor	Z = 1 .763 P = 1.000	Z = - 1.509 P = 1.000	Z = 1.926 P = .811	Z = .262 P = 1.000	
Low and Poor	Z = 5.572 P = .000*	Z = - 4.307 P = .000*	Z = 5.395 P = .000*	Z = 2.448 P = .215	Z = 2.364 P = .271
<div style="display: flex; justify-content: space-between;"> Same empowerment level & different wealth status Same wealth status & different empowerment level </div>					

This can be explained by the fact that the nutritional status of being thin, obese, overweight, or normal is often due to the quantity and quality of food a person eats (caloric intake) as compared to the movement and effort exerted (caloric

expenditure). Moreover, the quantity and quality of food are often controlled by many factors, the most important of which is the ability to control them.

A woman who is classified as belonging to a non-poor family in terms of wealth status will not likely have any obstacles in acquiring certain types and quantities of food. This will not require a certain degree of empowerment that enables her to negotiate and intervene in decision-making. In contrast, a woman who belongs to a poor family has a financial obstacle in providing different types and quantities of food. The reference in this matter, in this case, is to the extent of the woman's ability to intervene and negotiate in making the decision of providing such food.

A high level of women's empowerment means their full ability to manage family life, freedom of movement, and control over the quantity and quality of food required for the family. This is true even if these women's financial capabilities are limited as long as they have the freedom of making such choices and the ability to make optimal use of these capabilities. This is in contrast to low levels of women's empowerment, by which they lose the ability to participate in and negotiate decisions. In that case, the financial capabilities play a role in providing the required food in terms of quantity and quality.

The results of this study are in line with those of others who have investigated women's empowerment and their nutrition with the consideration of household wealth. A recent study found that malnutrition is common among mothers with a low level of empowerment [59]. In addition, [63], a study in East Africa indicated that empowerment positively and indirectly affects children's nutrition through good mothers' nutrition.

The strength of this study lies in taking household wealth into consideration when studying nutrition and empowerment. The results of the current study prove that high levels of wealth and empowerment are among the main factors controlling women's nutritional status in Egypt.

9. Conclusion and recommendations

9.1 Conclusion

- Most Egyptian women suffer from being overweight or obese. By taking the body mass index as an indicator of the nutritional status and studying the combined impact of empowerment and wealth on it, it turns out that Egyptian women either have a high level of empowerment, if they belong to a poor family, that prevents their nutritional status from being affected by their household wealth status, or they belong to a non-poor family that prevents their nutritional status from being affected by their empowerment level.
- Egypt is a country where nearly half of its population suffers from poverty. In light of the current economic crisis that the world is encountering, it is difficult to eradicate poverty in a short time. Empowering women in their families is the best way to improve Egyptian women's nutritional status. There will be no benefit from the recommendations of other medical and non-medical studies regarding proper nutrition and sports if women's empowerment is not activated.

9.2 Recommendations

This empowerment that will be sought will not bear fruit without raising awareness of the proper nutritional path that the Egyptian woman must follow in her and her family's lifestyle. Combining empowerment and awareness requires:

- The concerted efforts of several ministries, such as the Ministry of Health and Population, Information, Youth and Sports, and Awqaf, in directing two-pronged intensive awareness messages, in nutrition and sports, through all media and social media, such as those directed at avoiding infection with coronavirus disease (Covid-19), which bore fruits in controlling this epidemic inside Egypt.
- The religious discourse and the very important role of films and soap operas in expressing women's rights guaranteed by the heavenly legislations as well as correcting some misconceptions associated with the male domination within the family entity.
- Providing safe and clean venues or arenas for women to practice sports in all governorates all over Egypt for nominal fees through the efforts of the Ministry of Youth and Sport.
- Urging researchers to conduct detailed studies in the field of women's nutrition and the overlapping effects of some factors.

Conflict of interest

The authors declare that there is no conflict regarding the publication of this paper.

References

- [1] CAPMS,(2022). <https://www.capmas.gov.eg/>
- [2] C. A. f. P. M. a. S. (CAPMS), *Statistical Yearbook*, (2021). https://www.capmas.gov.eg/Pages/StaticPages.aspx?page_id=5034
- [3] A. Sedky, M. Gaber, N. Magdy, and S. El Safoury, Combating the High Prevalence of Obesity among Egyptian Households: A Pilot Study: Port-Said Households, (2021).
- [4] M. Aboulghate, A. Elaghoury, I. Elebrashy, N. Elkafrawy, G. Elshishiney, E. Abul-Magd, E. Bassiouny, D. Toaima, B. Elezbawy, A. Fasseeh, S. Abaza, and Z. Vokó, The Burden of Obesity in Egypt, *Frontiers in Public Health*, 9, (2021). <https://www.frontiersin.org/article/10.3389/fpubh.2021.718978>
- [5] F. El-Zanaty, *Egypt Health Issues Survey 2015*, (2015). <https://dhsprogram.com/pubs/pdf/FR313/FR313.pdf>
- [6] A. Hassanin, M. Hassanein, G. M. Lanier, M. Sadaka, M. Rifaat, and M. Sanhoury, Prevalence of obesity and its association with cardiometabolic risk factors, heart failure phenotype and mortality among patients hospitalized for heart failure in Egypt, *The Egyptian Heart Journal*, 74, 1, (2022). <https://doi.org/10.1186/s43044-021-00232-y>
- [7] E.-Z. a. Associates and International, *Egypt Demographic and Health Survey, 2014*, (2015). <https://dhsprogram.com/pubs/pdf/fr302/fr302.pdf>
- [8] P. Kumar, S. Srivastava, P. S. Mishra, and E. T. K. Mooss, Prevalence of pre-diabetes/type 2 diabetes among adolescents (10–19 years) and its association with different measures of overweight/obesity in India: a gendered perspective, *BMC Endocrine Disorders*, 21, 146, (2021). <https://doi.org/10.1186/s12902-021-00802-w>
- [9] O. Mehanna, A. El Askary, E. Ali, B. El Esawy, T. FathAlla, and A. F. Gharib, Impact of obesity and its associated comorbid conditions on COVID-19 presentation, *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy*, 14, 409, (2021).
- [10] I. Lingvay, P. Sumithran, R. V. Cohen, and C. W. le Roux, Obesity management as a primary treatment goal for type 2 diabetes: time to reframe the conversation, *The Lancet*, 399, 394-405, (2022). <https://www.sciencedirect.com/science/article/pii/S014067362101919X>
- [11] S. P. Marbaniang, H. Lhungdim, B. Yadav, and V. K. Yajurvedi, Overweight/obesity risks and prevalence of diabetes and hypertension in North Eastern India: An analysis using seemingly unrelated probit model, *Clinical Epidemiology and Global Health*, 11, 100764, (2021). <https://www.sciencedirect.com/science/article/pii/S2213398421000683>
- [12] S. Karjoo, A. Auriemma, T. Fraker, and H. E. Bays, Nonalcoholic fatty liver disease and obesity: An Obesity Medicine Association (OMA) Clinical Practice Statement (CPS) 2022, *Obesity Pillars*, 100027, (2022). <https://www.sciencedirect.com/science/article/pii/S2667368122000183>
- [13] J. Liu, I. Ayada, X. Zhang, L. Wang, Y. Li, T. Wen, Z. Ma, M. J. Bruno, R. J. de Knegt, W. Cao, M. P. Peppelenbosch, M. Ghanbari, Z. Li, and Q. Pan, Estimating Global Prevalence of Metabolic Dysfunction-Associated Fatty Liver Disease in Overweight or Obese Adults, *Clinical Gastroenterology and Hepatology*, 20, e573-e582, (2022). <https://www.sciencedirect.com/science/article/pii/S1542356521002081>
- [14] N. Finer, Weight loss interventions and nonalcoholic fatty liver disease: Optimizing liver outcomes, *Diabetes, Obesity and Metabolism*, 24, 44-54, (2022).
- [15] G. Lee, S. Choi, Y. Cho, and S. M. Park, Risk of osteoporotic fractures among obese women based on body mass index and waist circumference: a nationwide cohort in South Korea, *Clinical Nutrition Research*, 11, 32, (2022).
- [16] L. Chen, M. Zheng, Z. Chen, Y. Peng, C. Jones, S. Graves, P. Chen, R. Ruan, J. Papadimitriou, R. Carey-Smith, T. Leys, C. Mitchell, Y. G. Huang, D. Wood, M. Bulsara, and M. H. Zheng, The burden of end-stage osteoarthritis in Australia: a population-based study on the incidence of total knee replacement attributable to overweight/obesity, *Osteoarthritis and Cartilage*, (2021). <https://www.sciencedirect.com/science/article/pii/S1063458421009857>
- [17] F. W. Roemer, A. Guermazi, M. J. Hannon, T. Fujii, P. Omoumi, D. J. Hunter, F. Eckstein, and C. K. Kwok, Presence of Magnetic Resonance Imaging–Defined Inflammation Particularly in Overweight and Obese Women Increases Risk of Radiographic Knee Osteoarthritis: The POMA Study, *Arthritis Care & Research*, 74, 1391-1398, (2022).
- [18] J. Midgley, Osteoarthritis and obesity; conservative management, multi-morbidity, surgery and the implications of restricted access to knee or hip replacement: a literature review, *International Journal of Orthopaedic and Trauma Nursing*, 40, 100840, (2021). <https://www.sciencedirect.com/science/article/pii/S1878124120301520>

- [19] A. O. Agbaje, A. R. Barker, and T.-P. Tuomainen, Effects of arterial stiffness and carotid intima-media thickness progression on the risk of overweight/obesity and elevated blood pressure/hypertension: a Cross-Lagged Cohort Study, *Hypertension*, 79, 159-169, (2022).
- [20] K. S. d. S. Pontes, M. R. Guedes, M. R. d. Cunha, S. d. S. Mattos, M. I. Barreto Silva, M. F. Neves, B. C. A. A. Marques, and M. R. S. T. Klein, Effects of probiotics on body adiposity and cardiovascular risk markers in individuals with overweight and obesity: A systematic review and meta-analysis of randomized controlled trials, *Clinical Nutrition*, 40, 4915-4931, (2021). <https://www.sciencedirect.com/science/article/pii/S0261561421003198>
- [21] G. Battineni, G. G. Sagaro, N. Chintalapudi, F. Amenta, D. Tomassoni, and S. K. Tayebati, Impact of obesity-induced inflammation on cardiovascular diseases (CVD), *International Journal of Molecular Sciences*, 22, 4798, (2021).
- [22] A. Rosengren, Obesity and cardiovascular health: the size of the problem, *European Heart Journal*, 42, 3404, (2021).
- [23] T. M. Powell-Wiley, P. Poirier, L. E. Burke, J.-P. Després, P. Gordon-Larsen, C. J. Lavie, S. A. Lear, C. E. Ndumele, I. J. Neeland, and P. Sanders, Obesity and cardiovascular disease: a scientific statement from the American Heart Association, *Circulation*, 143, e984-e1010, (2021).
- [24] E. A. Silveira, N. Kliemann, M. Noll, N. Sarrafzadegan, and C. de Oliveira, Visceral obesity and incident cancer and cardiovascular disease: An integrative review of the epidemiological evidence, *Obesity reviews*, 22, e13088, (2021).
- [25] A. daSilva-deAbreu, B. A. Alhafez, C. J. Lavie, R. V. Milani, and H. O. Ventura, Interactions of hypertension, obesity, left ventricular hypertrophy, and heart failure, *Current Opinion in Cardiology*, 36, 453-460, (2021). https://journals.lww.com/co-cardiology/Fulltext/2021/07000/Interactions_of_hypertension,_obesity,_left.13.aspx
- [26] T. Barber, Why are women with polycystic ovary syndrome obese?, *British Medical Bulletin*, (2022).
- [27] T. M. Barber, P. Hanson, M. O. Weickert, and S. Franks, Obesity and polycystic ovary syndrome: implications for pathogenesis and novel management strategies, *Clinical Medicine Insights: Reproductive Health*, 13, 1179558119874042, (2019).
- [28] C. J. Glueck and N. Goldenberg, Characteristics of obesity in polycystic ovary syndrome: Etiology, treatment, and genetics, *Metabolism*, 92, 108-120, (2019). <https://www.sciencedirect.com/science/article/pii/S0026049518302336>
- [29] I. Deif, *World Obesity Day: Raising awareness about the economic and health toll of obesity in Egypt*, (2022). <https://english.ahram.org.eg/NewsContent/7/48/462448/Life--Style/Health/World-Obesity-Day-Raising-awareness-about-the-econ.aspx>
- [30] G. Palla, M. M. M. Guevara, A. Giannini, M. Caretto, P. Mannella, and T. Simoncini, *Impact of Polycystic Ovarian Syndrome, Metabolic Syndrome, and Obesity on Women's Health*, in *Impact of Polycystic Ovary, Metabolic Syndrome and Obesity on Women Health*, ed: Springer, 149-160, (2021).
- [31] T. Abraham and A. M. P. Romani, The Relationship between Obesity and Pre-Eclampsia: Incidental Risks and Identification of Potential Biomarkers for Pre-Eclampsia, *Cells*, 11, 1548, (2022). <https://www.mdpi.com/2073-4409/11/9/1548>
- [32] C. Trivett, Z. J. Lees, and D. J. Freeman, Adipose tissue function in healthy pregnancy, gestational diabetes mellitus and pre-eclampsia, *European Journal of Clinical Nutrition*, 75, 1745-1756, (2021). <https://doi.org/10.1038/s41430-021-00948-9>
- [33] P. S. Tallman, A. Valdes-Velasquez, and G. Sanchez-Samaniego, The “Double Burden of Malnutrition” in the Amazon: dietary change and drastic increases in obesity and anemia over 40 years among the Awajún, *Ecology of Food and Nutrition*, 61, 20-42, (2022). <https://doi.org/10.1080/03670244.2021.1916925>
- [34] M. N. H. Syah, The Relationship between Obesity and Anemia among Adolescent Girls, *Poltekita: Jurnal Ilmu Kesehatan*, 15, 355-359, (2022).
- [35] A. A. Wawer, N. A. Hodyl, S. Fairweather-Tait, and B. Froessler, Are Pregnant Women Who Are Living with Overweight or Obesity at Greater Risk of Developing Iron Deficiency/Anaemia?, *Nutrients*, 13, 1572, (2021). <https://www.mdpi.com/2072-6643/13/5/1572>
- [36] N. M. Alshwaiyat, A. Ahmad, W. M. R. Wan Hassan, and H. A. N. Al-Jamal, Association between obesity and iron deficiency, *Experimental and Therapeutic Medicine*, 22, 1-7, (2021).
- [37] N. Jantaratnotai, K. Mosikanon, Y. Lee, and R. S. McIntyre, The interface of depression and obesity, *Obesity Research & Clinical Practice*, 11, 1-10, (2017).

- [38] D. K. Longmore, J. E. Miller, S. Bekkering, C. Saner, E. Mifsud, Y. Zhu, R. Saffery, A. Nichol, G. Colditz, and K. R. Short, Diabetes and overweight/obesity are independent, nonadditive risk factors for in-hospital severity of COVID-19: an international, multicenter retrospective meta-analysis, *Diabetes Care*, 44, 1281-1290, (2021).
- [39] S. Smati, B. Tramunt, M. Wargny, C. Caussy, B. Gaborit, C. Vazier, B. Verges, D. Ancelle, C. Amadou, and L. A. Bachir, Relationship between obesity and severe COVID-19 outcomes in patients with type 2 diabetes: Results from the CORONADO study, *Diabetes, Obesity and Metabolism*, 23, 391-403, (2021).
- [40] D. J. Drucker, Diabetes, obesity, metabolism, and SARS-CoV-2 infection: the end of the beginning, *Cell Metabolism*, 33, 479-498, (2021). <https://www.sciencedirect.com/science/article/pii/S1550413121000164>
- [41] C. A. Remme, Sudden Cardiac Death in Diabetes and Obesity: Mechanisms and Therapeutic Strategies, *Canadian Journal of Cardiology*, 38, 418-426, (2022). <https://www.sciencedirect.com/science/article/pii/S0828282X22000058>
- [42] L. Lindberg, P. Danielsson, M. Persson, C. Marcus, and E. Hagman, Association of childhood obesity with risk of early all-cause and cause-specific mortality: A Swedish prospective cohort study, *PLoS medicine*, 17, e1003078, (2020).
- [43] T. Adair and A. D. Lopez, The role of overweight and obesity in adverse cardiovascular disease mortality trends: an analysis of multiple cause of death data from Australia and the USA, *BMC Medicine*, 18, 199, (2020). <https://doi.org/10.1186/s12916-020-01666-y>
- [44] N. Keum, D. Greenwood, D. H. Lee, R. Kim, D. Aune, W. Ju, F. Hu, and E. Giovannucci, Adult Weight Gain and Adiposity-Related Cancers: A Dose-Response Meta-Analysis of Prospective Observational Studies, *Journal of the National Cancer Institute*, 107, (2015).
- [45] I. C. Lega and L. L. Lipscombe, Review: Diabetes, Obesity, and Cancer—Pathophysiology and Clinical Implications, *Endocrine Reviews*, 41, 33-52, (2019). <https://doi.org/10.1210/edrev/bnz014>
- [46] C. J. Fernandez, A. S. George, N. A. Subrahmanyam, and J. M. Pappachan, Epidemiological link between obesity, type 2 diabetes mellitus and cancer, *World Journal of Methodology*, 11, 23, (2021).
- [47] M. I. Melek, *Impact of body mass index on outcomes of breast cancer management*, Thesis (M. S.), Faculty of Medicine, Assiut University, Egyptian Universities Libraries Consortium (EULC), (2022).
- [48] W. C. Research, *Fund International, Continuous Update Project Expert Report 2018*, (2018). <https://www.wcrf.org/diet-activity-and-cancer/>
- [49] S. M. d. F. Al-anzi, *Ten-year trends in bullying, discrimination and suicidality among adolescents experiencing overweight and obesity in British Columbia*, Text, University of British Columbia, (2021). <https://open.library.ubc.ca/collections/24/items/1.0402419>
- [50] L. M. Lessard, R. J. Watson, H. L. Schacter, C. W. Wheldon, and R. M. Puhl, Weight enumeration in United States anti-bullying laws: associations with rates and risks of weight-based bullying among sexual and gender minority adolescents, *Journal of Public Health Policy*, 43, 27-39, (2022). <https://doi.org/10.1057/s41271-021-00322-w>
- [51] R. A. Mokbel, A. A. A. E. Moustafa, and E. S. Y. Mahrous, Relation between Weight-Related Bullying and Emotional Reactions among Adolescents and Their Coping Strategies, *Egyptian Journal of Health Care*, 11, 892-913, (2020).
- [52] L. Saidova and A. Nazarova, PREVENTION OF INFERTILITY IN WOMEN OF REPRODUCTIVE AGE WITH OBESITY AND VITAMIN D DEFICIENCY, *Web of Scientist: International Scientific Research Journal*, 3, 1895-1901, (2022).
- [53] S. Al-Daydamouni, *The socio-economic problem of obesity in Egypt*, (2019). <https://theArabweekly.com/socio-economic-problem-obesity-egypt>
- [54] T. Omer, The causes of obesity: an in-depth review, *Adv Obes Weight Manag Control*, 10, 90-94, (2020).
- [55] O. Abdelkarim, A. Ammar, K. Trabelsi, H. Cthourou, D. Jekauc, K. Irandoust, M. Taheri, K. Bös, A. Woll, N. L. Bragazzi, and A. Hoekelmann, Prevalence of Underweight and Overweight and Its Association with Physical Fitness in Egyptian Schoolchildren, *International Journal of Environmental Research and Public Health*, 17, 75, (2020). <https://www.mdpi.com/1660-4601/17/1/75>
- [56] M. M. S. Abbass, Food consumption patterns among children and adolescents and their correlation with

- overweight/obesity in Egypt: A cross-sectional study, *Pielegniarstwo*, 149, (2020).
- [57] N. E. Hassan, S. Elshebini, N. Hassan, M. Selim, D. H. Amin, A. Nageeb, M. Ibrahim, and A. Khalil, Association between Quality of Diets and the Risk of Obesity Complication among a Sample of Egyptian Obese Women, *Open Access Macedonian Journal of Medical Sciences*, 10, 576-583, (2022).
- [58] S. Narayanan, E. Lentz, M. Fontana, A. De, and B. Kulkarni, Developing the Women's Empowerment in Nutrition Index in Two States of India, *Food Policy*, 89, 101780, (2019). <https://www.sciencedirect.com/science/article/pii/S0306919219306025>
- [59] A. Kabir, M. M. Rashid, K. Hossain, A. Khan, S. S. Sikder, and H. F. Gidding, Women's empowerment is associated with maternal nutrition and low birth weight: evidence from Bangladesh Demographic Health Survey, *BMC Women's Health*, 20, 93, (2020). <https://doi.org/10.1186/s12905-020-00952-4>
- [60] S. Gupta, P. Pingali, and P. Pinstrup-Andersen, Women's empowerment and nutrition status: The case of iron deficiency in India, *Food Policy*, 88, 101763, (2019). <https://www.sciencedirect.com/science/article/pii/S0306919219305858>
- [61] S. Hossain, M. M. Khudri, and R. Banik, Regional education and wealth-related inequalities in malnutrition among women in Bangladesh, *Public Health Nutrition*, 25, 1639-1657, (2022). <https://www.cambridge.org/core/article/regional-education-and-wealthrelated-inequalities-in-malnutrition-among-women-in-bangladesh/47FD07BDCD7DA654135835BDEDC31354>
- [62] R. E. Jones, R. Haardörfer, U. Ramakrishnan, K. M. Yount, S. S. Miedema, T. D. Roach, and A. W. Girard, Intrinsic and instrumental agency associated with nutritional status of East African women, *Social Science & Medicine*, 247, 112803, (2020). <https://www.sciencedirect.com/science/article/pii/S0277953620300228>
- [63] R. Jones, R. Haardörfer, U. Ramakrishnan, K. M. Yount, S. Miedema, and A. W. Girard, Women's empowerment and child nutrition: The role of intrinsic agency, *SSM - Population Health*, 9, 100475, (2019). <https://www.sciencedirect.com/science/article/pii/S2352827318302519>
- [64] A. Quisumbing, J. Heckert, S. Faas, G. Ramani, K. Raghunathan, H. Malapit, and P.-W. f. M. I. S. Team, Women's empowerment, food systems, and nutrition, *Background paper for the Rural Development Report*, (2021).
- [65] S. Ishfaq, A. Anjum, S. Kouser, G. Nightingale, and R. Jepson, The relationship between women's empowerment and household food and nutrition security in Pakistan, *PLoS one*, 17, e0275713, (2022).
- [66] S. Gupta, V. Vemireddy, P. Seth, and P. L. Pingali, Bridging the intrahousehold dietary gap—the role of economic growth and women's nutritional empowerment: Evidence from India, (2022).
- [67] T. N. Haregu, S. F. Mohamed, S. Muthuri, C. Khayeka-Wandabwa, and C. Kyobutungi, Body mass index and wealth index: positively correlated indicators of health and wealth inequalities in Nairobi slums, *Global Health, Epidemiology and Genomics*, 3, e11, (2018). <https://www.cambridge.org/core/article/body-mass-index-and-wealth-index-positively-correlated-indicators-of-health-and-wealth-inequalities-in-nairobi-slums/14CD4E919261FBA59A647E2ABBCC7EDD>
- [68] S. Yaya and B. Ghose, Trend in overweight and obesity among women of reproductive age in Uganda: 1995–2016, *Obesity Science & Practice*, 5, 312-323, (2019). <https://doi.org/10.1002/osp4.351>
- [69] H. Waghmare, S. Chauhan, and S. K. Sharma, Prevalence and determinants of nutritional status among women and children in Pakistan, *BMC Public Health*, 22, 766, (2022). <https://doi.org/10.1186/s12889-022-13059-2>
- [70] M. o. H. a. P. (M.H.P), *100millionseha*, (2022). <http://www.100millionseha.org/>
- [71] R. Aly, Empowerment as a Mediator between Education and Reproductive Health Care in Egypt: The Impact of Poverty and Residence, *Open Journal of Social Sciences*, 09, 58-76, (2021). <https://www.scirp.org/journal/paperinformation.aspx?paperid=107647>