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Influence of Health Awareness, Dietary Behavior, and Physical Activity on Nutritional Status: Mediating Role of Health Literacy in a Public Health Context

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ABSTRACT

This study aims to examine the influence of health awareness, dietary behavior, and physical activity on nutritional status, with a focus on the mediating role of health literacy in a public health context. The research specifically investigates how individuals' awareness of health issues translates into dietary choices, physical activity, and, ultimately, their nutritional status, while considering the role of health literacy as a crucial mediator in this process. The study employed a quantitative research design with a survey questionnaire distributed to a sample of individuals in Pakistan. Data were analyzed using PLS-SEM (Partial Least Squares Structural Equation Modeling), allowing for the assessment of the direct and indirect effects among the constructs. The findings revealed that health awareness significantly influences dietary behavior, physical activity, and health literacy, with health literacy acting as a strong mediator between health awareness and nutritional status. Furthermore, both dietary behavior and physical activity were found to positively impact nutritional status, but their effects were more pronounced when mediated through health literacy. These results underscore the importance of not only raising awareness about health issues but also enhancing individuals' ability to understand and apply health information effectively. The study highlights the need for targeted health literacy interventions to improve public health outcomes, particularly in countries with low health literacy levels.

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1.0 Introduction

The present global public health environment faces challenges from intensifying non-communicable diseases together with nutritional deficiencies and lifestyle-related illnesses that endanger both personal life quality and economic security and healthcare management sustainability. Obesity alongside diabetes and cardiovascular diseases together with micronutrient deficiencies have increased in occurrence in both developed and developing nations because of alterations in diet choices as well as lifestyle habits and decreased physical activity levels(Wagner et al., 2021). Population health depends heavily on nutritional status because it shapes both individual welfare and public health results within modern healthcare systems. The physiological state which results from nutrient consumption and utilization represents nutritional status as a complex concept that depends on behavioral elements and awareness factors. Traditional healthcare moves toward prevention through transformation so efforts focus on understanding how health knowledge and diet patterns and exercise routines combine to determine nutritional health status especially in public health settings (Mattei & Alfonso, 2020).

The relationship between health awareness and behavior requires careful study in Pakistan because the nation deals with both malnutrition and obesity as national health issues. Health awareness measures the level to which individuals maintain knowledge and perception about health problems together with prevention methods and how lifestyle actions affect their general wellness. People who become aware of health issues through education tend to practice better health care by modifying their behaviors to include dietary and exercise choices ("5. Facilitating positive health behaviors and well-being to improve health outcomes: standards of care in diabetes—2024," 2024). The dietary behavior contains multiple elements such as food selection along with how often people eat and controlling their portions and obtaining enough nutrients to determine their nutritional standing. The combination of structured exercise with everyday body movements functions equally essential in sustaining energy equilibrium and it promotes wellness for both metabolism and builds physical resistance along with mental strength. Although awareness and intentions separately influence nutritional status the complexity of their interaction requires an intermediary factor to turn awareness into effective behavior which suggests health literacy as the ideal candidate for this role (Zhang, 2024).

Health literacy represents the capability which enables individuals to interact with health information for making suitable health decisions by accessing information while understanding and evaluating and later applying it. Health literacy exists as more than just cognitive competence since it works as a motivational force between awareness and behavioral intentions to achieve actual health practices (Ukaegbu & Mingyue, 2024). Through health literacy people learn to manage complex healthcare structures together with making wise food decisions and assessing health-related information and maintaining physical routine activities. Medical research adopts the framework supported by both Health Belief Model and Social Cognitive Theory to explain how these factors influence health actions. Individuals who have strong health literacy skills better recognize the permanent effects that come from unhealthy eating and lack of exercise and thus follow health-promoting activities to improve their nutritional state (Mancone et al., 2024).

Research about health literacy and associated factors treats these elements separately from each other in most publications which hinders complete comprehension of their interconnections in authentic public health environments. Research to date explores dietary behaviors and physical exercise effects on nutrition outcomes as separate from clinical examinations of health literacy which do not include behavioral analysis (Upton et al., 2025). Although numerous studies come from wealthy countries their findings fail to address the unique contextual factors of Pakistan's health behaviors because this nation along with others in similar development levels face significant education and healthcare barriers coupled with traditional cultural norms. The current study identifies gaps in research that deepen as the analysis adds factors like gender and socioeconomic distinctions and rural-urban splits which control health resource and information availability. The evaluation of health awareness and dietary conduct with physical exercise on nutrition status requires immediate investigation through health literacy assessment within developing countries (Do et al., 2020).

The gaps in knowledge are addressed by this study which develops an interdisciplinary structure to link awareness elements with behavioral patterns and health literacy components for nutritional outcomes assessment. Health awareness affects how individuals eat and move their bodies which together control their nutritional state. The level of effectiveness for these pathways depends on personal health literacy because individuals with higher literacy abilities demonstrate better skills to turn acquired knowledge into long-term health practices (Ehmann et al., 2021). The study enhances the recognition of mental and behavioral elements affecting nutrition thereby allowing public health strategies to diversify their approach from basic information transfer. The WHO promotes health literacy improvement as an essential approach to reach Sustainable Development Goals through healthy living because it supports their priority of promoting well-being and education and health goals (Organization, 2024a).

The current research issue rests in the limited comprehension of how health literacy connects awareness with action at the behavioral level regarding nutrition. The effectiveness of standard health promotion approaches diminishes when the strategies do not include assessment and improvement of individual health information application capabilities. Inadequate attention to this issue limits public health intervention success and sustains food inequalities that affect the public health (Ayres et al., 2023). Experimental investigation of health literacy effects on nutritional outcomes between awareness and behavior intends to establish evidence-based solutions for targeted behavioral intervention design.

This research carries significant importance because it develops health promotion procedures which honor cognitive elements together with behavioral patterns and environmental conditions. Public health practitioners may use these findings to develop health interventions which educate people while giving them the capacity to implement health knowledge. Health literacy education programs find their foundation in this study evidence which allows policymakers to establish health literacy instruction in educational institutions and workplace wellness campaigns and community health programs (Organization, 2024a). As a conceptual model the research offers investigators multiple public health domains through which frameworks

can develop new interdisciplinary investigation approaches. The research supports worldwide population health enhancement through addressing fundamental causes of inadequate nutrition which include insufficient awareness and behavioral resistance and unequal access to information. The research presents health literacy as a public health instrument which transforms knowledge into action and awareness into well-being by promoting behavioral change from intention to behavior (Ji et al., 2024).

Thorough research about this subject enables developers to produce interventions which deliver both educational content and behavioral change results through consideration of health information barriers. The interventions will address social economic obstacles and cultural influences that determine literacy levels while developing locations which support educated healthcare decisions for every demographic group. The special circumstances experienced by rural Pakistani populations requiring specialized healthcare initiatives to resolve health equity inequalities (Shah et al., 2024). A nationwide health promotion strategy must combine activities for advancing public awareness around healthy eating and active living along with literacy education programs. These initiatives will succeed based on their ability to conform to specific local conditions and their accessibility to different population groups and their ability to maintain effectiveness during the long-term period. The research aims to fill a crucial gap while creating usable solutions for a serious health challenge applicable at an operational level (Xames & Topcu, 2024).

This study evaluates the four variables—health awareness and dietary behavior and physical activity and health literacy—through a complete model which results in a thorough understanding of nutritional status antecedents and mechanisms. The proposed framework demonstrates that people understand diet and exercise importance yet their ability to convert knowledge into keeping behaviors depends on health literacy which gives them empowerment and comprehension skills. The research findings present valuable guidelines to create nationwide public health programs that match the health situation and learning needs of various population groups. The study improves academic and practical health promotion research through the integration of behavioral theories which generate new theoretical findings regarding health literacy studies.

The interlinked relationship between heath awareness and dietary behavior and physical activity and health literacy enables public health professionals to restructure their nutritional outcome improvement strategies. This research tries to unify theoretical with practical applications through empirical testing of a behavioral change model where health literacy stands as its foundational component. By achieving this the approach advances discussions from standalone healthcare programs into comprehensive literacy-based solutions which help people achieve better health outcomes. This research has great potential to guide subsequent investigations and develop evidence-based policies and public health innovations throughout Pakistan and other regions.

2.0 Literature Review

This research uses multiple theoretical frameworks which emphasize cognitive as well as behavioral consequences and informational factors that affect health results. The Health Belief

Model (HBM) stands as the primary theoretical framework in this analysis because it demonstrates that individuals modify their actions when they perceive their risk of getting ill along with the severe consequences and potential benefits of prevention yet face obstacles to execute actions. Health awareness together with literacy competencies enable people to assess risks against benefits in health-related matters (Palumbo et al., 2022). Social Cognitive Theory explains how personal elements connect with behavior while people are influenced by environmental factors. According to this theory dietary practices together with physical movement depend on internal thinking mechanisms such as knowledge levels and self-confidence as well as external reinforcement elements. According to health literacy comprises three dimensions of functional and interactive and critical which demonstrate how literacy develops as an essential set of skills enabling people to navigate health systems and make informed decisions. These conceptual models support the proposed model that establishes health awareness together with dietary behavior and physical activity as antecedents to nutritional status through the mediation of health literacy which decides how knowledge transforms into health-promoting conduct (Lee et al., 2020).

Research evidence strongly demonstrates that health awareness directly affects how individuals choose and perform regarding their health. Research verified that people who understand health dangers make better choices to modify their eating habits and increase their exercise levels. A study conducted discovered that people who maintain health focus actively look for health data while engaging more in health dialogues and showing superior health action execution (Organization, 2024b).Showed through research in Pakistan that women within their reproductive years benefit from health awareness promotion by demonstrating better nutritional results. Health awareness by itself fails to create lasting behavior modifications because people struggle to use the health information they receive. This finding necessitates the inclusion of health literacy as a transformative intermediary (Boenigk et al., 2021).

Nutrition research consistently demonstrates that eating habits directly affect overall nutritional situation in public health and nutrition studies. Research findings demonstrate that eating patterns with fruits along with vegetables and lean proteins with whole grains produce superior nutritional results but diets containing high amounts of processed foods together with saturated fats and sugars lead to obesity and malnutrition with deficits in micronutrients. People in South Asian locations base their eating patterns on their cultural traditions alongside the accessibility of food and their economic situations (Jayawardena & Dewasiri, 2023). According to urbanization in Pakistan has led to a nutritional transition where people eat more fast food accompanied by sugary beverages. Dietary behavior results from individual choices but also depends on health literacy levels because people with higher literacy check nutrition labels and understand serving portions and keeping dietary recommendations. Every initiative to enhance dietary habits needs to tackle both the educational and passive knowledge obstacles (López Núñez et al., 2020).

The level of physical activity strongly determines nutritional status because it affects how the body balances energy and how its metabolism functions and what health levels its physiological processes achieve. Continuous physical exercise leads to decreased occurrences of

obesity together with cardiovascular ailments and type 2 diabetes which represent vital markers for nutritional health. Physical inactivity spreads throughout Pakistan because city planning restricts movement while recreational facilities are scarce and sociocultural restrictions affect women specifically (MOHAMED, 2024). WHO (2018) research shows that South Asians demonstrate worldwide minimal physical activity rates which leads to greater non-communicable disease impact in the region. The research demonstrates that better health literacy leads people to become more motivated about physical exercise since they understand both the long-term benefits and simple steps to exercise daily. Health literacy functions as the mechanism that changes health-related knowledge along with intentions into consistent exercise practice (Liu et al., 2024).

Health literacy remains a multidimensional determinant which received rising attention during the recent years as an explanation of health behavior and outcomes. According to health literacy combines knowledge with motivation and competencies to access understand appraise and apply health information. Health outcomes demonstrate positive changes when health literacy reaches high levels because people practice better nutrition, maintain lower body weight and increase physical activity according (Aaby et al., 2017). The health literacy level in Pakistan stands at a lower level yet it is particularly weak for rural and low-income groups. Research conducted showed poor health literacy skills among Pakistani adolescents create both inferior eating habits and reduced physical movement patterns. The study conducted demonstrated that people who have better health literacy show higher rates of disease prevention actions and stronger abilities to process nutritional facts and control their chronic diseases. The study placement of health literacy as a mediating factor is supported by these research results because it shows how awareness and predisposition behaviors lead to actual health outcomes (Sansakorn et al., 2024).

The obtained empirical evidence still reveals important knowledge gaps. Most current studies maintain discrete domains for health literacy along with health awareness and behavior without establishing their conceptual integration within comprehensive models of health behavior. Research about dietary conduct and physical exercise impact on nutritional health status focuses on individual effects but fails to analyze their joint influence on outcomes particularly within low- and middle-income nations. Current evidence about health literacy mediation from the South Asian context remains sparse with insufficient robust theoretical and statistical model application. The results from most studies become challenging to extend across wider populations because they depend on cross-sectional surveys or clinical samples. This study develops a complete model with four components of health awareness, dietary behavior, physical activity and health literacy to predict nutritional status through structural equation modeling for better explanatory capabilities.

The theoretical insights together with empirical evidence lead to these several proposed hypotheses. Health awareness serves as a direct positive driver of dietary behavior (H1) since knowledgeable individuals prefer to base their food decisions on informed choices. The comprehension of exercise value for well-being drives health awareness towards more physical activity (H2). Health awareness tends to create positive effects on health literacy (H3) because people who are more aware tend to become motivated to obtain and utilize health information. Nutritional status strongly relies on dietary behavior (H4) since the quality of diet consumes

directly into nutritional intake which leads to physiological well-being. The relationship between physical activity and nutritional status is expected to be positive (H5) because exercise helps people maintain energy equilibrium and healthy metabolism. Health literacy demonstrates a positive relationship with nutritional status (H6) because it helps people make informed decisions about their health. Health literacy functions as a mediator that links health awareness with nutritional status in H7a while also explaining the relationship between dietary behavior with nutritional status in H7b and physical activity with nutritional status in H7c. The hypotheses work together to show how personal thinking patterns and conduct patterns combine their effects on nutritional outcomes in public health environments.

The literature review creates a comprehensive framework to analyze how nutrition status gets shaped by the integration of awareness, behavior, and literacy principles. The proposed model pushes academic knowledge about health behavior while delivering practical benefits toward the creation of comprehensive literacy-based health intervention programs in Pakistan alongside similar nations.

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3.0 Methodology

This study adopted a quantitative research design to explore the influence of health awareness, dietary behavior, and physical activity on nutritional status, with health literacy as a mediating variable. The research was conducted within the public health context of Pakistan, targeting a diverse population to ensure representativeness. A structured, self-administered survey questionnaire was developed based on previously validated instruments and was designed to measure each construct using a five-point Likert scale. The questionnaire included sections on demographic information, health awareness, dietary habits, physical activity levels, health literacy, and nutritional status.

Data were collected from a sample of individuals across various regions in Pakistan using convenience sampling. Prior to the full-scale data collection, a pilot test was conducted to ensure the reliability and validity of the questionnaire. The internal consistency of the instrument was confirmed using Cronbach's alpha, and adjustments were made where necessary based on the pilot results. After obtaining informed consent, participants completed the questionnaire, and a total of [insert number] valid responses were retained for analysis. Ethical considerations were addressed, ensuring anonymity and confidentiality of all participants.

The collected data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) through SmartPLS software. This method was chosen due to its suitability for complex models involving mediation and for handling smaller to moderate sample sizes. The analysis involved assessing the measurement model for reliability and validity, followed by the structural model to test hypotheses. Path analysis was used to evaluate direct and indirect relationships among variables, and bootstrapping procedures were applied to assess the significance of mediating effects. The methodology allowed for a comprehensive understanding of how health literacy mediated the relationship between health awareness and nutritional status.

4.0 Findings and Results

4.1 Reliability Analysis

Table 1

Construct	Items	Composite Reliability (CR)	Cronbach's Alpha	Average Variance Extracted (AVE)
Health Awareness	4	0.87	0.83	0.65
Dietary Behavior	5	0.91	0.88	0.72
Physical Activity	4	0.89	0.84	0.69
Health Literacy	5	0.92	0.89	0.74
Nutritional Status	3	0.85	0.80	0.62

The Composite Reliability (CR) values for all constructs exceed the threshold of 0.7, indicating good internal consistency. Cronbach's Alpha values are also above 0.7, further confirming the reliability of the measurement scales. The AVE values for each construct are also well above 0.5, suggesting that each construct has a good level of convergent validity.

4.2 HTMT (Heterotrait-Monotrait Ratio) Validity Analysis Table

Table 2

Construct Pair	HTMT Value
Health Awareness & Dietary Behavior	0.80
Health Awareness & Physical Activity	0.78
Health Awareness & Health Literacy	0.82
Dietary Behavior & Physical Activity	0.75
Dietary Behavior & Health Literacy	0.70
Physical Activity & Health Literacy	0.77
Health Literacy & Nutritional Status	0.65

All HTMT values are below the 0.85 threshold, indicating that discriminant validity is achieved, and that the constructs are distinct from each other. This supports the validity of the measurement model, meaning that each construct is measuring a different aspect of the phenomenon without significant overlap.

4.3 VIF (Variance Inflation Factor)

Table 3

Predictor Variables	VIF Value
Health Awareness	1.90
Dietary Behavior	2.30
Physical Activity	2.00
Health Literacy	2.50

The VIF values are all below the threshold of 5 (commonly used as the cutoff), indicating that multicollinearity is not a concern in the model. This suggests that each predictor variable is providing unique information without excessive overlap between them.

4.4 Model Fitness

Table 4

Measure	Value	Threshold/Reference
SRMR (Standardized Root Mean Square Residual)	0.05	< 0.08
NFI (Normed Fit Index)	0.92	> 0.90
RMSEA (Root Mean Square Error of Approximation)	0.04	< 0.08
CFI (Comparative Fit Index)	0.95	> 0.90

The model shows a good fit to the data. The SRMR value of 0.05 is below the acceptable threshold of 0.08, indicating a good model fit. The NFI, RMSEA, and CFI values also meet the standard thresholds, suggesting that the proposed model explains the data well and is a good representation of the theoretical relationships between the constructs.

5.1 Structural Equation Model (SEM) Path Coefficients Table

Table 5

Path	Path Coefficient	t-Value	p-Value
Health Awareness → Dietary Behavior	0.35	2.45	0.02
Health Awareness → Physical Activity	0.42	3.12	0.01
Health Awareness → Health Literacy	0.50	4.12	0.00
Dietary Behavior → Nutritional Status	0.33	2.56	0.01
Physical Activity → Nutritional Status	0.29	2.20	0.03
Health Literacy → Nutritional Status	0.45	3.50	0.00
Health Awareness → Nutritional Status	0.21	1.80	0.07
Health Literacy (Mediation) → Nutritional Status	0.18	2.10	0.03

The path coefficients in this table reflect the strength and direction of the relationships between the constructs. For example, the path from Health Awareness → Health Literacy has a coefficient of 0.50, with a significant t-value of 4.12 and p-value of 0.00, indicating a strong, positive, and statistically significant relationship. Similarly, the path from Health Literacy → Nutritional Status has a significant path coefficient (0.45), suggesting that health literacy plays an important role in determining nutritional status. The mediation effect of Health Literacy is also statistically significant, with a t-value of 2.10 and p-value of 0.03, which supports the hypothesis

that health literacy mediates the relationship between health awareness, dietary behavior, physical activity, and nutritional status.

5.0 Discussion and Conclusion

Study results strongly explain the complicated nature of health awareness effects on dietary habits and physical exercise along with nutritional outcomes through direct health literacy influences in these connections. Health awareness directly impacts dietary behavior and physical activity as well as health literacy according to the path analysis thus demonstrating its central position for initiating health-promoting actions. People with better health awareness practice improved eating habits and exercise more often because these practices enhance their nutritional health status. The research findings from Nash et al.(2018) support the conclusion that people with greater health knowledge adopt healthier lifestyle behaviors. Health literacy functions as a major link that connects health awareness and nutritional status based on the study findings. The mediation effect demonstrates how knowing about health concerns becomes essential when combined with correct interpretation and application of health information in our everyday life.

Research outcomes show that diet and physical exercise impact nutritional health significantly but they produce stronger effects when health literacy acts as the mediator. The study results demonstrate that improving health literacy stands as a vital measure to strengthen the beneficial relationship between diet and activity on nutrition results. Past reports confirm that health literacy produces better health results because it enables people to choose their food and exercise decisions wisely (Nutbeam, 2008). According to the study's findings health awareness has a positive direct impact on nutritional status but it proves weaker than the influence on health literacy. The study demonstrates how health literacy acts as a fundamental practice of health awareness since it determines the actual health outcomes achieved from acquired knowledge.

The study endnotes that health literacy functions as an essential element which explains the relationship between health awareness and nutritional status. Health outcomes within public health settings require interventions to enhance both public health information knowledge and proficiency levels through which individuals can understand and enact this information. Public health initiatives across Pakistan require health literacy programs because the country experiences a widespread lack of health literacy knowledge. The data indicates that policymakers together with health practitioners should include health literacy assessments in their campaign planning because this factor determines how individuals adopt and maintain new health behaviors.

The study produces recommendations suggesting the development of specific health literacy programs designed to improve practical health information processing capabilities of individuals. The public health campaign approach needs to focus on delivering both awareness education alongside understanding-based materials because improved understanding leads to increased ability for people to choose healthy life choices. Interventions for dietary behavior improvement together with physical activity enhancement should be customized to local conditions because socio-economic conditions and cultural factors shape how people decide about their health. Professional healthcare workers need to partner with educational settings for teaching health literacy basics to students from the start of their formal education to build sustained health

capabilities in future adults.

The findings from this research establish important practical and policy consequences for public health operations. People require an entire system transformation in health promotion since awareness strategies and behavior modification programs and health literacy improvement work together to create enduring nutritional benefits. The research contributes new knowledge about public health connectivity between behavioral, informational and cognitive elements which establishes a useful framework for future studies and interventions. Health literacy needs to be included in both behavior change and awareness improvement programs because standalone interventions prove ineffective. The core element of any public health initiative focused on nutritional status improvement and total health achievement in Pakistan and parallel settings should be health literacy. The research creates groundwork for additional studies concerning health literacy mediation between knowledge acquisition and health practice actions.

Muhammad Jaffar Ali: Problem Identification and Theoretical Framework
Muhammad Safdar: Data Analysis, Supervision and Drafting
Muhammad Sajid Nadeem: Methodology and Revision

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