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# Obsession or Wellness? Orthorexia Nervosa among Gym Enthusiasts, Athletes, and Nutritionists

**Ayesha Siddiqua Syeda[1], Radhika Hedaoo[2,*], Keren Susan Cherian[3], Mansi Patil[4], Sammita Jadhav[1], Anuja Mohile[5]**

[1]Symbiosis Institute of Health Sciences, Symbiosis International (Deemed University), India
[2]Nutrition and Dietetics Program, Symbiosis School of Culinary Arts and Nutritional Sciences, Symbiosis International (Deemed University), India
[3]Sports Nutrition, Department of Sports Physiology and Nutrition, National Sports University (NSU), India
[4]Asha Kiran Jubilee Hope Centre Hospital, Chinchwad, India
[5]School of Beauty, Wellness, Nutritional Sciences & Dietetics, Symbiosis Skills and Professional University, India

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**Abstract** Orthorexia nervosa (ON), an emergent eating disorder, presents as an obsession with healthy eating among nutrition and sports professionals as well as fitness enthusiasts. However, it often goes unmonitored. This study aimed to determine the prevalence of ON, an obsession with healthy eating, and its association with the extent of health concerns, exercise addiction, and depression among fitness enthusiasts. Data was collected from 154 respondents aged 18-30 years (45.5% males and 54.5% females) categorized as gym enthusiasts, weight-sensitive sports athletes, and nutritionists using validated questionnaires -ORTO-15, Health Concern Scale, Exercise Addiction Inventory, and Patient Health Questionnaire-9. The prevalence of ON was assessed and the association between ON and other variables was determined using logistic regression. The overall prevalence of ON was 53.24% across the study groups, with the highest prevalence among gym-enthusiasts (63.8%) followed by weight-sensitive athletes (56.1%) and nutritionists (40%) respectively. The ORTO-15 scores showed a significant negative correlation with BMI (r=-0.215), Health Concern Scale (r=-0.438), and Exercise Addiction Inventory (r= -0.370), irrespective of gender and the study group. A significant association between higher health concern scores and the development of ON was observed (71.8% probability, p value=0.002). Orthorexia tendencies were prevalent across the study groups. This highlights the severity of the phenomena. An excessive preoccupation with healthy eating and dietary restrictions may result in mental health consequences, the risk of nutritional deficiencies despite appearing health-conscious, and contribute to an unhealthy fixation on body image.

**Keywords** ON, Eating Disorder, Exercise Addiction, Health Concern, Dietary Obsessions, Depression, Mental Health

## 1. Introduction

The growing focus on eating habits and their beneficial impact on overall well-being is gaining traction among health enthusiasts and diverse healthcare experts. Nevertheless, this increased emphasis has also been related with the emergence or exacerbation of eating disorders [1]. Orthorexia nervosa manifests as an eating disorder marked by an excessive fixation on consuming "healthy" foods, coupled with a rigid and unyielding approach to diet, resulting in notable medical or psychosocial challenges.

When diet and eating behaviors are measured, dietitians, athletes, and fitness enthusiasts, who are the torch bearers of eating habits, and their advocacy are frequently idolized. A concomitant professional hazard emerging among these professionals is orthorexia nervosa (ON), which is an obsessive concern with consuming "pure" or "clean" foods. Dr. Steven Bratman coined the term "orthorexia" in 1997 by fusing the Greek words, "ortho" (meaning right or correct) and "orexia" (meaning appetite) [1]. Since then, the cases of ON have been reported and documented in research. A healthy balanced diet is a prerequisite for health and wellbeing; however, an obsession with the same is detrimental to physical and mental health. ON involves selective eating; this negatively affects the nutritional status, and leads to malnutrition and weight loss, resulting in poor health and inferior quality of life [2]. Orthorexia is centered on the quality and purity of food, as opposed to other eating disorders like anorexia or bulimia, which concern the amount of food consumed. People with orthorexia become fixated on eating only things they perceive to be pure or healthy, frequently eliminating entire food groups or specific drugs from their diet.

Fitness enthusiasts, dietitians, and nutritionists are in the more vulnerable groups among young people. Globally, 30−70% of healthcare professionals have ON [3]: 88.7% of nutritionists in Brazil and 49.5% of registered dietitians in America are at risk for ON [4]. In addition, 67.4% of students who study nutrition and health are at risk for ON in a faculty of health science-based research in Malaysia [5]. Accompanying obsessive behaviors such as overindulgence in sports or physical activity are observed.

Exercise addiction inventory is a psychometric tool that measures the unhealthy obsession with exercise [6,7]. Excessive exercising is most commonly observed in athletes with ON [8]. It often exerts negative psychological effects and results in negative social outcomes. Over time, the obsession becomes intense, leading to the feeling of shame, anxiety, and social isolation [9,10]. Athletes and those participating in weight-sensitive sports, where body weight influences performance, are vulnerable to extreme eating behaviors; they often resort to strict dietary restrictions [11,12]. The prevalence of ON is higher among athletes, irrespective of gender, in line with a higher prevalence of eating disorders and obsessive-compulsive symptoms, compared to that in the non-athletic group [13]. Obsessive eating habits can lead to low energy availability and clinical outcomes such as reduced bone mass density, eating disorders, and menstrual irregularities, particularly among female athletes. People with ON consider food as a source of health rather than pleasure; therefore, they follow alternative diets that are perceived as “healthy” such as vegan, organic, and macrobiotic. In extreme cases, ON can have the same consequences as any other eating disorder such as nutritional deficiencies, inflammation, electrolyte imbalance, and hormonal imbalances. There have been a few attempts to create diagnostic standards for ON, but none have received formal approval to date; however, it is apparent that eating disorders, depression, and health concerns are inter-related. A tool widely used to measure and evaluate an individual's health concerns, risks, and overall well-being is the “Health Concern Scale” [14], which gathers information about the various aspects of a person’s health, lifestyle, medical history, and behaviors that are risk factors for healthy lifestyle.

The Health Concern Scale (HCS), Exercise Addiction Inventory (EAI), Patient Health Questionnaire-9 (PHQ-9) and ORTO-15 are psychometric instruments that are used to assess multiple psychological issues and health-related behaviors. The condition known as orthorexia nervosa, which is marked by an obsession with eating healthily, is particularly measured by the ORTO-15. It assesses the degree of strict dietary practices and attitudes towards eating well. When analyzing health-related anxiety, the Health Concern Scale is frequently utilized in conjunction with orthorexia measures to gauge an individual's level of concern about their health. The Exercise Addiction Inventory helps identify people who may be at risk for exercise addiction, a condition in which engaging in physical activity turns destructive and compulsive. As orthorexia behaviours and exercise addiction are related, they can be linked to one another. A prominent tool for determining depression is the Patient Health Questionnaire-9, which measures symptoms like exhaustion, and low mood. PHQ-9 is used to help identify co-occurring mental health disorders, such as depression, which may result from or be exacerbated by bad eating and exercise habits in research investigating orthorexia and exercise addiction [15]. When combined, these instruments provide a thorough evaluation of the behavioural, emotional, and psychological aspects of health-related actions.

We hypothesized that the prevalence of ON would differ among different groups under study. Therefore, the primary objectives included determining the prevalence of ON among the selected young adults in India, consisting of fitness enthusiasts, nutritionists, and weight-sensitive sports athletes as specified groups and examining its association with the extent of health concerns, exercise addiction, and depression among fitness enthusiasts. By addressing these objectives, the study aimed to contribute to a deeper understanding of orthorexia nervosa within the context of Indian athletes, gym-goers, and nutritionists, shedding light on its prevalence and potential contributing factors.

## 2. Materials and Methods

### 2.1. Participant Characteristics

In this cross-sectional study, purposive sampling was used to specifically select individuals who were most likely to demonstrate behaviours or characteristics linked to ON risk. Given their higher priority on perceived healthy foods, exercise, and well-being, the sample included weight-

sensitive athletes, gym-goers, and nutritionists respectively. Considering a high focus on dietary restrictions, physical appearance and body image among gym goers, they were chosen for the study. Likewise, the weight-sensitive athletes especially who are training for body building, gymnastics or weight training were recruited as they need to specially follow strict dietary restrictions and have targeted weights.

Given that nutritionists frequently provide evidence-based guidance and advice on good dietary choices and lifestyle adoptions, it was important to have their subgroup for determining the probability of risk for ON.

Targeted outreach to fitness facilities, sports clubs, gyms, and nutritionist professional associations resulted in recruitment. Individuals who work as qualified nutrition professionals or who regularly participate in sports or fitness activities, work in hospitals and who were between 18-30 years of age were important inclusion criteria. Participants were found through cooperation with gym management, sports coaches, and nutritionist associations and forums wellness clinics and sports centres in Bangalore and Pune, India. In order to encourage participants to recommend people in their network who fit the study's requirements, snowball sampling was also used.

The athletes training, nutritionist practicing and gym goers for at least three consecutive years were considered as inclusion criteria. These inclusion criteria were decided to ensure the consistency as per their profile in the groups. Para-athletes and athletes/trainees suffering from any physical injury or deformity or any physical/ physiological/ known psychosomatic illness/disease were excluded from the study. The sample consisted of 154 participants; 55 nutritionists, 58 gym-goers, and 41 weight-sensitive sports athletes. The study proposal received approval from both the Research Advisory Committee and the University's Independent Ethics Committee. Written informed consent was obtained from all participants prior to their inclusion in the study. Questionnaires were administered through interviews conducted via online video calls. The interviews via online video calls were primarily driven by practical considerations, including the need for social distancing during the study period and the convenience of reaching geographically dispersed participants in a limited time. The questionnaires included ORTO-15, a 15-item questionnaire to determine the risk of ON a scale scored from 1 (always) to 4 (never). The lower scores show a higher risk of ON and scores below 40 suggested high risk [16], secondly, Health Concern Scale (HCS) was used containing 20 items which are rated on a scale from 1 ( not concerned at all) to 7 ( very much concerned ) and the total score is calculated by summing all responses; higher scores indicate greater concerns about one's health [14], thirdly, Exercise Addiction Inventory (EAI) containing six-item questionnaire was used in which each item is scored on a 5 point Likert scale with a score of 1 = strongly disagree to 5 strongly agree and scores are the lowest as 6 and the highest as 30. A score more than 24 indicates exercise addiction [17], and lastly Patient Health Questionnaire-9 (PHQ-9) contains 9 items, each suggestive of depressive disorders. The items are scored from 0 (not at all) to 3 (every day nearly) with total scores ranging between 0-27. The cut-offs for scores include 5-9 as mild depression, 10-14 as moderate depression, 15-19 as moderately severe depression and a score of $\geq 20$ indicating severe depression [15]. All these questionnaires have demonstrated good reliability and validity in previous research studies ensuring their appropriateness for evaluating orthorexic tendencies, health concerns, exercise addiction, and depression respectively. A brief overview of the above-mentioned questionnaires was provided to participants and each question of the questionnaire was read aloud to the participants, ensuring they understood each item and the participants were encouraged to provide honest responses based on their own experiences and attitudes. In addition, sociodemographic details such as age, gender, occupation, education, food habits, types of physical training and anthropometric measurements such as height, weight, BMI, were collected. For anthropometric measurements, the data maintained in the gyms, wellness centres and sports centres were used which the participants reported through the records. Care was taken that recently collected anthropometric data was used and the data was not old.

### 2.2. Statistical Analysis

Statistical analysis was performed using SPSS version 28. All data was presented as frequency, mean, standard deviation, and percentage. The association between ON and other variables was determined using Chi square test, and student's *t*-test. Multiple regression analysis was used to ascertain the correlation between ORTO-15 scores and other variables. The study pursues to explore how ON (dependent variable) relates to the extent of health concerns, exercise addiction, and depression (independent variables). The significance was set at $p < 0.05$.

## 3. Results

The normality of the data was tested using Shapiro-Wilk Test and the data across the three groups (weight-sensitive sport athletes, gym-goers and nutritionists). The two groups (weight-sensitive sport athletes and gym-goers) were found to be normally distributed. However, the third group (nutritionists) deviated from normal distribution ($p = <0.05$). The body mass index, and the level of training differed substantially among the groups ($p<0.005$). There was a gender bias in the data across the groups, with all nutritionists being female and a majority of the athletes being male. Food habits and sports involvement varied among the groups. A relatively higher percentage of nutritionists were vegetarians; they spent less time exercising, performing only endurance type activities. The

athletes belonged to the opposite end of the spectrum. Irrespective of the group, the majority of the participants (78%) were non-vegetarians as shown in Table 1.

Table 2 demonstrates the overall prevalence of ON as 53.24%, with gym-goers exhibiting the highest prevalence (63.80%), followed by weight-sensitive athletes (56.10%) and nutritionists (40.00%). The HCS scores showed no significant difference among the groups; however, the concern was higher among nutritionists and lower among gym-goers. The EAI scores suggested that the majority of the participants exhibited no risk for addiction; however, 22% of the athletes showed a higher risk for addiction compared to that in the other groups. The PHQ-9 scores indicated that the majority (up to 80%) of the participants experienced minimal depression, who had scores ranging from 0 to 4 indicative of minimal or no depression symptoms followed by around 20% experiencing mild depressive symptoms, who had scores between 5 to 9 indicative of mild depression symptoms. No significant difference across the study groups was observed. The group at high risk for ON exhibited a higher BMI and health concern score compared to the other group. No such difference was observed in terms of exercise addiction and depressive symptoms.

**Table 1.** Basic characteristics of the study participants -weight-sensitive athletes, gym-goers, and nutritionists, (n=154)

| **Variables** | **n** | **Study Participants** | | | **p-value** |
|---|---|---|---|---|---|
| | | Weight-sensitive athletes (n = 41) | Gym-goers (n = 58) | Nutritionists (n = 55) | |
| **Gender** | | | | | |
| Male | 70 | 65.90% | 67.20% | 7.30% | <0.001 |
| Female | 84 | 34.10% | 32.80% | 92.70% | |
| **Education** | | | | | |
| Under graduation | 91 | 70.70% | 87.90% | 20.00% | <0.001 |
| Post-graduation | 61 | 26.80% | 12.10% | 78.20% | |
| PhD | 2 | 2.40% | 0.00% | 1.80% | |
| **Food Habits** | | | | | |
| Vegetarian | 24 | 7.30% | 10.30% | 27.30% | <0.001 |
| Lacto-Ova -Vegetarian | 32 | 41.50% | 12.10% | 14.50% | |
| Non-vegetarian | 98 | 51.20% | 77.60% | 58.20% | |
| **Exercise/sport played** | | | | | |
| Endurance | 45 | 24.40% | 15.50% | 47.30% | <0.001 |
| Strength | 28 | 7.30% | 25.90% | 18.20% | |
| Team/Intermittent | 59 | 68.30% | 36.20% | 18.20% | |
| Combined | 18 | 0.00% | 22.40% | 9.10% | |
| No activity | 4 | 0.00% | 0.00% | 7.30% | |
| **BMI** | | | | | |
| Underweight | 0 | 0 | 0 | 0 | |
| Normal weight | 85 | 63.40% | 48.30% | 56.40% | 0.276 |
| Overweight | 50 | 26.80% | 32.80% | 36.40% | |
| Obese | 19 | 9.80% | 19.00% | 7.30% | |

Table 1 presents categorical variables across three groups (weight-sensitive athletes, gym-goers, and nutritionists) using *Chi-square test*

**Table 2.** Classification of participants based on their risk for ON and associated health behaviours using Chi Square test

| Variables | n | Study Participants | | | p-value |
|---|---|---|---|---|---|
| | | Weight-sensitive Athletes | Gym-goers | Nutritionists | |
| **ORTO-15** | | | | | |
| High-risk for ON | 82 | 56.10% | 63.80% | 40.00% | 0.037 |
| Low-risk for ON | 72 | 43.90% | 36.20% | 60.00% | |
| **Health Concern Scale** | | | | | |
| Low Health Concern | 26 | 16.70% | 46.20% | 36.70% | 0.254 |
| Medium Health Concern | 24 | 50.00% | 26.90% | 26.70% | |
| High Health Concern | 24 | 33.30% | 26.90% | 36.70% | |
| **Exercise Addiction Inventory** | | | | | |
| No addiction (Score < 29) | 68 | 77.80% | 92.30% | 100% | 0.024 |
| Exercise Addiction (Score > 29) | 6 | 22.20% | 7.70% | 0.00% | |
| **Patient Health Questionnaire - 9** | | | | | |
| No Depression | 51 | 75.00% | 79.30% | 80.00% | 0.872 |
| Mild Depression | 12 | 18.80% | 17.20% | 20.00% | |
| Moderate to Severe Depression | 2 | 6.30% | 3.40% | 0.00% | |

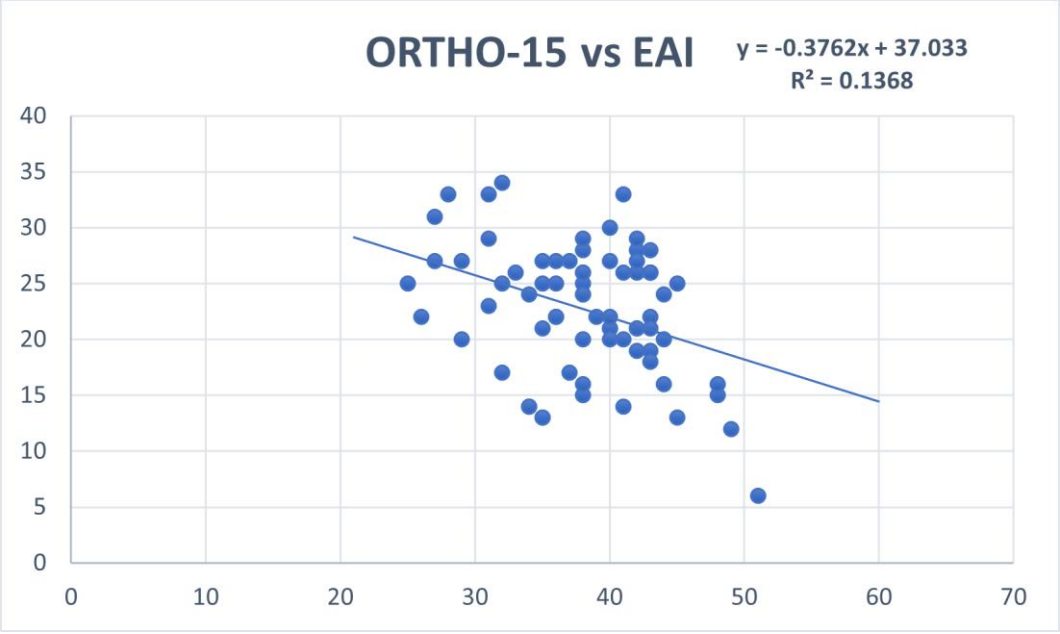


**Figure 1.** Correlation of ORTO-15 scores with Exercise Addiction Inventory (EAI) scores using regression

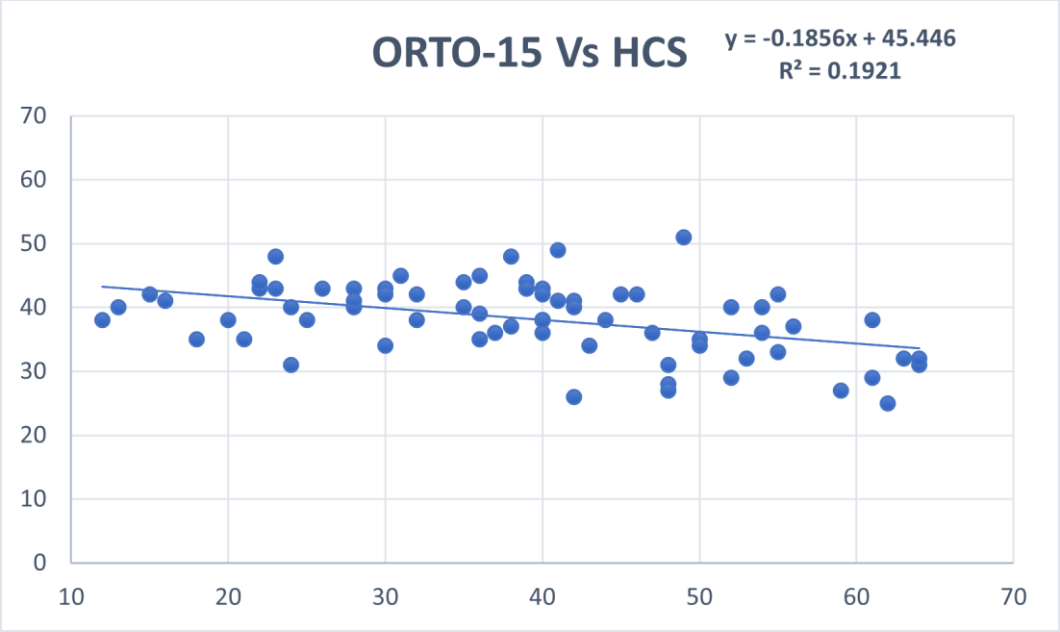


**Figure 2.** Correlation of ORTO-15 scores with Health Concern Scale (HCS) scores using regression

**Table 3.** ORTO-15 and its association with age, BMI, health concern, exercise addiction, and depression in males and females (n=154)

| Variable | n | ORTO -15 score (Low) (n = 82) | ORTO -15 score (High) (n = 72) | p-value |
|---|---|---|---|---|
| **Mean Age** | 154 | 22.4 ±3.04 | 22.6 ±2.61 | 0.585 |
| **BMI (kg/m$^2$)** | 154 | 23.6 ±3.67 | 22.4 ±3.13 | 0.039* |
| **Health Concern Scale** | 74 | 43.3 ±13.74 | 34.2 ±10.87 | 0.003* |
| **Exercise Addiction Inventory** | 74 | 23.5 ±5.55 | 21.7 ±5.74 | 0.163 |
| **Patient Health Questionnaire - 9** | 65 | 6.8 ±4.19 | 5.7 ±3.10 | 0.234 |
| **Males** | | | | |
| **Age** | 70 | 22.2 ±3.41 | 22.2 ±2.93 | 0.988 |
| **BMI (kg/m$^2$)** | 70 | 23.7 ±3.44 | 22.6 ±2.88 | 0.155 |
| **Health Concern Scale** | 23 | 45.2 ±17.45 | 33.1 ±7.59 | 0.121 |
| **Exercise Addiction Inventory** | 23 | 24.7 ±5.92 | 24.3 ±5.97 | 0.849 |
| **Patient Health Questionnaire - 9** | 26 | 6.8 ±4.96 | 5.3 ±2.74 | 0.354 |
| **Females** | | | | |
| **Mean Age** | 84 | 22.6 ±2.63 | 22.9 ±2.37 | 0.581 |
| **BMI (kg/m$^2$)** | 84 | 23.5 ±3.95 | 22.4 ±3.31 | 0.166 |
| **Health Concern Scale** | 51 | 43.8 ±12.09 | 34.8 ±12.19 | 0.011* |
| **Exercise Addiction Inventory** | 51 | 23.0 ±5.41 | 20.5 ±5.34 | 0.104 |
| **Patient Health Questionnaire - 9** | 39 | 6.9 ±3.69 | 6.0 ±3.36 | 0.459 |

ORTO-15 and its association with age, BMI, health concern, exercise addiction, and depression in males and females (n=154) were calculated using t test

The ORTO-15 scores showed a significant negative correlation with BMI (r=-0.215), Health Concern Scale (r=-0.438), and Exercise Addiction Inventory (r=-0.370), irrespective of gender and study groups as shown in Figures 1 and 2 respectively.

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Step-wise multiple regression analysis indicated that for every unit increase in ORTHO-15, there was a 0.209 unit decrease in the HCS scores (r-square=0.187, SEE=5.394). The forward logistic regression analysis indicated that there was a 71.8% probability that individuals with higher health concern scores had ON, and there was a 54.3% probability that individuals without ON had lower health concern scores. The overall predictability was 63.5% (p-value=0.002). For every 0.058 time increase in HCS, there was a unit decrease in the risk of ON (S.E. = 0.021 and OR=0.943). The association between HCS and ORTHO-15 was stronger among males compared to that in females; the association with EAI and BMI combined (combined r-square=0.296, SEE=5.31) was better in females as shown in Table 3.

## 4. Discussion

Understanding the prevalence of ON, especially in association with sport and exercise, is limited, particularly in India [18]. To the best of our knowledge, this is the first study to compare the prevalence of ON across three distinct groups delineated by diet and exercise habits (weight-sensitive sports athletes, gym-goers, and nutritionists). The prevalence of ON risk was 53.24% among the respondents, with the lowest risk prevalence among nutritionists. There was a strong association between ON and the health concern scale scores; however, such an association was not observed for exercise addiction or depression scales. The overall prevalence of ON risk in this study was 53.24%, which was lower than that reported among the university students of the United States of America; however, it was higher than that in the university students from Australia (21%) [19].

The highest prevalence of ON risk was observed among gym-goers (63.8%) in the Indian scenario. The probable reason could be the focus on physical appearance and body shape found in fitness enthusiasts and an observance of fitness trends and culture found among gym goers. However, this was in contrast to a reported study from Italy where athletes, particularly those in weight-sensitive sports, were at a higher risk for ON, eating disorders, and obsessive-compulsive symptoms [20]. Compared to the other two groups of weight-sensitive athletes and nutritionists, it has been observed that they are trained professionally for physical activity, healthy lifestyle and balanced diet regimes which makes the risk comparatively lower among Indian athletes and Indian nutritionists. The prevalence of ON risk in athletes was 56%; however, 41.3 to 88.3% of athletes, irrespective of sex, age, type of sport or hours of training per week, exhibiting traits of ON in Poland [21]. People working in health care professions were also at risk of developing ON [22]. Nutritionists reported a 40% prevalence of ON risk and however exhibited a lower risk compared to athletes and gym-goers. The reason could be the inclusion of nutritionists who were post graduates with greater awareness of food and nutrition, in contrast to those whose nutrition practices are driven by limited knowledge and personal experiences.

A qualitative study in the Netherlands reported the presence of pseudo nutrition coaches or experts on social media as one of the main environmental factors for the higher prevalence of ON [23]. Such weight-loss-focused eating patterns that often gain popularity rapidly but may lack scientific evidence supporting their effectiveness or long-term sustainability. These diets usually involve extreme dietary restrictions and can include approaches like low-fat, low-carbohydrate, gluten-free, or other restrictive diets. It is significant to note that the ORTO-15, the tool applied in this study, doesn't provide a formal diagnosis of Orthorexia Nervosa (ON); rather, it assesses the risk for the condition. The ORTO-15 aims to evaluate individuals based on their food preferences and eating patterns who may be at risk of developing ON. Since it is not a diagnostic tool, it cannot verify whether ON is present.

Health Concern Score was a strong predictor of ON, with males showing a stronger association. This was in line with another study, which reported a higher occurrence of ON and a lower score for health-related quality of life among students who exercise [24]. A study on Polish university students reported contrasting observations; there was no association between the health concern scale and eating concern scale and ON [25].

Although the data for males had considerable missing values, multiple imputation was performed using SPSS software to handle the missing data. It's crucial to take into account that bias may still exist due to male higher percentage of missing values, especially when comparing health issues, exercise addiction, and depression based on gender. We have considered this likely limitation when interpreting our results, and we suggest more investigation to validate these findings in a larger, more comprehensive sample.

In female participants, there was an association between ON and higher exercise addiction and BMI. With every unit decrease in ON Scores, there was an increase of 0.509 times in the EAI and 0.561 times in the BMI (r-square=0.296, SEE=5.305). This was in line with studies reporting that exercise addiction was closely associated with ON; female German fitness enthusiasts were more vulnerable [26]. Although the present study showed a weak negative correlation between ORTO-15 scores and BMI observed (r = -0.215), it revealed an intricate and nuanced

association between Orthorexia Nervosa (ON) and body weight. While the association was weak statistically, it has demonstrated a pattern of BMI in ON. Considering the limited sample size, there is a possibility of a weak association as well. Also, the multi-layered nature of ON, where individuals focus more on the perceived quality of their diet than on its quantity, potentially leads to less noticeable weight changes compared to other eating disorders. The weak correlation also highlights the likelihood of other influencers, such as mental health, intake of nutrients, or body composition, influencing this relationship. BMI though used as a basic measure may not be adequate to fully understand the effects of ON on an individual's overall health. The study findings suggest that more severe orthorexia behaviors (lower ON scores) in female participants are moderately associated with higher BMI and increased exercise addiction. According to these results, women who have an orthorexic tendency are more inclined to exercise excessively, which may have an impact on their body weight. But as the moderate R-square value and the SEE's variability suggest, there might be more factors at play in these associations. It is also to be noted that BMI could not be a good indicator for obesity or malnutrition among athletes.

As a result, even though an athlete has a healthy body composition, their BMI alone may nevertheless indicate that they are overweight or obese, or they may not show abnormal BMI even in cases of malnutrition. Alternatively, body composition parameters, such as body fat percentage, should be used in further research to better assess athletes' physical and nutritional wellbeing. The current study's findings about the weak to moderate correlations between exercise addiction, BMI, and ON may be partly explained by this limitation. A pathological eating behavior pattern was observed in the ON group with a greater prevalence of obsessive-compulsive disorder and/or higher anxiety and depression, as indicated by the PHQ-9 scores [27,28].

Female participants with ON have substandard mental health; ON is considered as a behavioral disorder. Obsessive behavior is considered as the cause for the decline in mental health attributes; however, further research is required to classify it as a mental health disorder [29]. Young females with an ambitious personality driven by perfectionism and obsessive-compulsiveness are at an increased risk of developing ON [30]. However, in this study, no such association was observed with the PHQ-9 scores and a majority of the participants were classified as minimally depressed. The study has certain limitations, including the use of purposive sampling and a relatively small sample size. These factors may affect the generalizability of the findings to the broader population. The generalizability of the current findings is limited because these samples do not represent the general population and there is a lack of an appropriate control group. Therefore, the study is only descriptive in nature. We also recognize individuals who had restricted access to technology to participate in interviews via online video calls have not been included which further restricts the generalizability of the study. However, the study aimed to ensure that the sample reflected the characteristics of our target population (e.g., gym-goers, athletes, and nutritionists), who are generally more likely to have access to the necessary technology due to their higher engagement with fitness and health apps these days. Yet, our decision to conduct interviews via online video calls was primarily driven by practical considerations, including the need for social distancing during the study period and the convenience of reaching geographically dispersed participants in a limited time. Another limitation was the self-reported anthropometric measurements which could have created a bias. While this is a recognized limitation, the logistical challenge of conducting in-person assessments due to limited access to the individuals was a limitation and therefore the data maintained in the gyms, wellness centres and sports centres was used which the participants reported through the records. Care was taken that recently taken anthropometric data was used and the data was not old. Various studies have used self-reported data with moderate validity when study participants have been instructed clearly about the confidentiality of the data maintained by researchers.

Also, self-reported anthropometric data have been commonly used in similar studies and, while not perfect, have shown reasonable validity when participants are instructed clearly.

Nevertheless, this study is significant as it evaluated the prevalence of ON across three study groups with different background knowledge and motivation toward diet. It helps understand the prevalence of ON in Indian professionals working in close association with food such as nutritionists/dietitians, athletes, and gym-goers. The study revealed the association of ON with exercise addiction, health concern, and depression in these study groups. Further studies with more elaborate sampling are required to explore the determinants of obsessive-compulsive eating and exercise behavior. Personality traits should be considered in the upcoming research on this disorder because they could augment our understanding of how ON influences certain psychological interactions.

# 5. Conclusions

53.2% of respondents had ON risk overall; the most vulnerable group was gym-goers (63.8%), followed by athletes who were concerned about their weight (56.1%) and lastly nutritionists (40%). The BMI and exercise addiction of females with ON were higher than those of individuals with a lower risk of ON; the higher the risk of ON, the higher the risk of exercise addiction. However, BMI by itself is not a good predictor of obesity or malnourishment in athletes, which emphasises the necessity for more accurate measurements like body fat percentage. The study further emphasises that, as opposed

to offering a formal diagnosis of ON, the ORTO-15 instrument evaluates risk. In order to confirm these results and explore a practical approach for managing ON risk in an Indian context, more investigation is necessary.

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Not applicable.

## Conflict of Interest

The authors have no conflicts of interest to declare.

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