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LOGICAL FALLACIES AS A POSSIBLE SOURCE OF MISCONCEPTIONS AND INADEQUATE PATIENT RECOMMENDATIONS GIVEN BY MEDICAL PROFESSIONALS – A PRELIMINARY REVIEW

Abstract. The aim of this article was to prepare a basis for further quantitative research concerning the nutritional knowledge of medical professionals (doctors) and dieticians in view of the accuracy of dietary recommendations given to patients. For this purpose, a review of literature data in this area was performed and logical fallacies were proposed as the 'tool' that doctors rely on in cases when they lack the proper knowledge required to be able give an informed and beneficial recommendation. In the course of the study, it was found that nutritional education is neglected in medical curricula, while dieticians are underused as professionals in clinical settings. Furthermore, numerous characteristics of the medical profession and the doctor–patient relationship are conducive to committing several types of logical fallacies, prompted mainly by the need for providing advice without delay and the infallibility traditionally expected from doctors. Hence, the gaps in nutritional knowledge and the fallacious character of recommendations, in addition to the re-valuation of the role of the nutritionist, need to be further investigated in order to improve the quality of patient advice in the area of dietary requirements as well as to propose the necessary changes in curricula.

Keywords: logical fallacies, nutritionists, dietary recommendations, study programmes.

Introduction

Nutrition plays a very important role in the prevention and treatment of a wide range of diseases, including cardiovascular disorders, diabetes, and overweight/obesity, which are the leading causes of morbidity and mortality. Due to the growing awareness of this importance, nutrition is a field of science in a state of rapid development, despite its fairly short history as a separate discipline. Moreover, current dietary fads and the popular media contribute to the widespread visibility of nutrition, as manifested in the popularity of various diets, the so-called organic foods, the vegan and vegetarian movements, or food blogs, among many other trends. Unfortunately, this wealth of information does not mean that it is in fact evidence-based; quite the contrary, it is largely based on myths and traditionally held beliefs, leading to committing a number of fallacies.

Logical fallacies occur in cases when a false premise and/or faulty logic are used to reach a fallacious conclusion which the person committing the fallacy considers correct. They often result from employing heuristics in reasoning and are extremely common in areas of human activity that are especially prone to propagating information that is not evidence based but which due to its ubiquitous nature and its being a crucial part of the everyday life. As mentioned, nutrition is one of such fields and myths, half-truths, and notions that have not been scientifically proved lead to a false sense of competence mainly due to the argumentum ad populum, i.e. appeal to the majority, and the appeal to tradition fallacies. As pointed out by Wynn (2022), "[l]ogical fallacies can affect routine and complex decision-making, potentially leading to a reduction in the efficacy or application of robust evidence to care," which indicates that they are indeed a problem in medical settings. This is confirmed by Bowes et al. (2020), who claim that logical fallacies, cognitive biases, and heuristics "permeate everyday clinical decision-making processes and adversely affect the accuracy of clinical judgments, even among the many practitioners who are capable, knowledgeable, and highly intelligent," underlying the susceptibility to committing errors in logic irrespective of the person's level of education and/or intelligence.

It must be emphasized that being prone to logical fallacies is not correlated in a linear manner with the persons' level of education, knowledge, and/or IQ. Especially without a background in critical thinking, any person is susceptible to committing logical fallacies due to the very nature of how the human brain deals with information (or lack of it), using apophenia, i.e. recognizing meaningful connections when logically there are none, to fill

any inconvenient gaps in knowledge, even if this process is not realized on a conscious level. Hence, physicians are also prone to committing fallacies, especially in areas of expertise in which they are not proficient enough, with General Practitioners probably the group most susceptible to hasty generalizations. This stems from the need to provide advice within an extremely diverse range of problems in an expedient manner. It is worth noting that due to patients' expectations, GPs feel that in those cases when they lack sufficient knowledge, they should resort to vague advice so as not to undermine their authority by simply stating that they do not know what the advice should be. As it is unreasonable to expect that GPs would be able to not only address all of the diverse medical issues they encounter but also do it without delay, the described situations should be taught as part of doctor–patient communication skills, as the willingness to meet expectations and maintain authority must not lead to erroneous or useless health recommendations.

The aim of this paper is to outline the issue of inadequacies in medical professionals' knowledge in the area of nutrition and to propose a number of logical fallacies that inform the actual nutritional recommendations that doctors issue to patients, in place of evidence-based information.

Literature review

The authors of this study planned to compare the knowledge of medical professionals in the area of nutrition with that of nutritionists. When reviewing the available literature, however, it transpired that there is an almost complete lack of studies that would deal with assessing nutritionists' competences. Still, the single study that made this comparison (Abdollahi et al., 2013) showed that nutritionists made fewer mistakes in a test concerning nutrition (15% of false answers compared to 25% in the case of doctors), which suggests that their role in patient-oriented settings should be re-evaluated and adequately improved. Thus, the authors plan to follow up this paper with their own comparative study regarding this issue.

Although it might seem that medical practitioners' gaps in knowledge concerning diet and nutrition can be attributed simply to inadequacies of curricula in this area, studies suggest that the main source of inadequate nutritional knowledge might in fact lay elsewhere (Walsh et al., 2011). In the study, nutritional attitudes and knowledge of medical students who completed an integrated nutrition curriculum were compared with those who completed a dedicated nutrition curriculum. No statistically significant

differences were found in the comparison, with 69.3% and 68.3% correct answers in the test, respectively. This suggests that in practice, students' nutritional knowledge – and the resultant gaps – must largely be drawn from sources other than academic education.

Moreover, according to Adams et al. (2006) nutritional education is very limited in most medical schools, which raises doubts as to the ability of future doctors to give their patients adequate advice on a proper diet. The study also showed that as much as 94% of those taking part in the survey indicated the need for nutritional education. This is further confirmed by Alkhaidy (2019), whose study showed a 50% correct response rate among physicians taking part in their study assessing nutritional knowledge. In a study by Vetter et al. (2008), only 46% of interns felt proficient in calculating the BMI and the WHR, while 54% knew the correct amount of calories contained in gram of protein, which is again a strikingly low score for a profession expected to give accurate recommendations. This indicates that integrating nutritional knowledge into medical schools' curricula is indeed a pressing issue that could develop doctors' competences in the area of nutrition so that they would reach a level that would be adequate for patients' needs.

The results of a study by Özçelik et al. (2007) are particularly striking considering the depth of the problems concerning the lacks in physicians' nutritional expertise. They discovered that only $< 10\%$ of the physicians taking part in the study answered correctly questions concerning the ingredient that increases the excretion of calcium from the body and which fibre fraction helps to reduce cholesterol levels. It is worth reiterating that such a low proportion of erroneous answers to questions concerning fairly basic elements of nutrition gives cause for concern as to the accuracy of physicians' recommendations.

Apart from those studies that focus mainly on ingredients of diet and their role in particular conditions, there are also those that deal with other related aspects. Mowe et al. (2008) found out that 39% of the physicians participating in the study were not familiar with techniques for the identification of malnourished patients, while 53% had problems with calculating the energy demand of patients. Similarly, Zeldman et al. (2020) identified digestion, absorption, and metabolism of nutrients, food safety, nutrition labelling of products, dietary management in particular conditions/diseases, and the presence of macronutrients in food sources as those that medical professional are least familiar with ($< 50\%$ of correct answers). As can be seen, the level of knowledge that informs the decision-making process in inpatient hospital settings is also troublesome. It would seem that the most obvious solution

would be a greater reliance on the competences of nutritionists; this process, however, seems to be hindered by attitudes rooted in the ad hominem fallacy, As outlined by Petric (2020), the 'arguer' (i.e. the nutritionist) is attacked by the doctor as incompetent although the 'argument' (i.e. the advice) is correct.

Medical universities in Poland also pay very little attention to nutrition as a separate module in the curricula. For example, Medical University of Białystok offers as little as three didactic hours, which is a staggeringly low load, dedicated strictly to nutrition in the form a seminar "The role of diet in disease prevention" that is part of classes taught to first-year students of medicine entitled "Basic of preventive medicine with elements of telemedicine" (Uniwrsytet Medyczny w Białymstoku, 2022). At the same time, doctors do not seem to recognize that this is in fact not only a crucial element of their expertise but also a complex science in its own right. This fact and the aforementioned studies suggest that medical professionals' knowledge in this field must be susceptible to the availability heuristic and thus mainly sourced mainly non-academic outlets, prone to overgeneralizations and the propagation of myths and fallacies, or simply based on their prior convictions.

Anecdotal data obtained from medical practitioners from hospitals in Białystok, Poland, show that they are becoming aware of the seriousness and the widespread character of the problem of inadequate background in nutrition. Despite this realization, however, doctors do not seem to refrain from issuing nutritional recommendations in cases when they lack the necessary knowledge. In addition, studies suggest that a large proportion of those medical practitioners who demonstrate a low level of nutritional knowledge (30.4%) regard themselves as proficient in the area (Grammatikopoulou et al., 2019), which is a typical manifestation of the Dunning-Kruger effect, i.e. "the tendency towards overestimation [depending] on the underlying ability level with less capable people showing the highest degree of overestimation" (Hofer et al., 2022).

Hence, considering the following:

1. Inadequate contents of syllabuses of medical courses in the area of nutrition
2. Unsatisfactory level of medical professionals' knowledge in the area of nutrition
3. Recommendations concerning nutrition being issued by doctors regardless of their competences in the area
4. Insufficient reliance on nutritionists' expertise in hospital settings
5. The prevalence of nutritional myths in widely available sources

It is safe to assume that the information patients are given concerning nutrition may largely result from those issuing the recommendations unknowingly committing a number of logical fallacies.

Logical fallacies as the source of nutritional misconceptions

First of all, it is safe to assume that hasty generalizations and overgeneralizations are the most common fallacies committed in medical settings when nutrition is concerned. Probably the most telling overgeneralization – based on an equivocation, i.e. using imprecise and/or vague terms where precise one should be used – are situations in which doctors tell patients to simply 'eat healthy food', without further elaboration. This underscores two important problems, namely 1) the misconception that there exists a universal category of 'healthy food' that is part of the common consensus, and 2) the fact that doctors are not only unaware of the intricacies of nutrition but also do not realize the importance and the patient's need for precise and evidence-based recommendations.

Apart from hasty generalizations, the other logical fallacy that doctors seem to be most prone to committing is false analogy. A study conducted by Dolatkhah et al. (2019) indicates that by far the most problematic area of nutrition among doctors concerns fat contents in various foods. Another study, conducted by Temple (1999), also lists aspects of diet connected with fats as the area in which doctors are not proficient enough, while Alkhaldy (2019) adds the issue of fats as sources of energy. Due to the fact that facts as ingredients of people's diet are widely associated with obesity, one may be prone to fallacies that lead to grouping all food products containing fats as those that patients should avoid, with the possible distinction made between plant and animal fats. This obviously disregards all the complexities concerning fat as nutrients, e.g. the distinction between saturated, unsaturated, trans, etc. fats, which makes this process also one of hasty generalization. However, as far as false analogy is concerned, it is important to note that making an analogy between 'fat', i.e. the ingredient, and 'fat', i.e. the property, also seems to be the source of problems. As Dolatkhah et al. (2019) point out, among those aspects of nutrition that doctors fail to address correctly is the content of fat in meat, pasta, and cheese, as well as naming the products that contain saturated fatty acids. Interestingly, this is also the area in which students taking part in the research demonstrated the greatest lack of knowledge. This suggests that the inadequacies of doctors' knowledge in the discussed area are seri-

ous and might be based on a number of false analogies. For instance, the properties of certain foods as they 'seem' to be (e.g. avocado and nuts are not commonly associated with containing large amounts of fats although they do) and the actual properties of their ingredients. Such generalizations are rooted in false analogies based on superficial features of foods, hence giving recommendations on their basis is a manifestation of a false sense of being competent. The described logical fallacies, originating from commonly held beliefs, are as common as they are easy to recognize, but without a background in critical thinking doctors may be extremely susceptible to committing them.

An extremely common fallacy that permeates the field of nutrition both in the general society and the academia is appeal to nature. The logical fallacy is largely unchallenged and persists through advertising, articles, classes with students, and the world of science. The rapid development of the possibilities of technology, including genetic modifications, has led to a resurgence of movements that proselytize a 'return to nature' approach, with the consumption of organic (i.e. grown without the use of pesticides and artificial fertilizers), non-GMO foods, produced by local farmers, as the main assumptions. While the sentiment itself, i.e. the focus on a healthy diet, can hardly be challenged, the very concept of 'organic' foods is based on this particular logical fallacy, i.e. appeal to nature. In short, nutritional value and health benefits do not depend on the origin of a certain food. In other words, a molecule does not 'remember' where it came from, thus foods grown organically are not inherently more or less healthy that foods produced in any other way. What matters is their chemical composition, which cannot be simply condensed into the 'natural' vs. 'artificial' dichotomy.

The aforementioned misconceptions stemming from committing the appeal to nature logical fallacy are exacerbated by the extremely common instances of equivocation. The words 'organic' or 'natural' themselves lack a precise definition and their fuzzy meaning is often limited to forming a contrast with the misunderstood concept of 'chemical' or 'artificial' products, namely those produced in a non-organic way. This leads to another logical fallacy, i.e. false dichotomy, based on the fallacious assumption that not only is there a good-bad (healthy-unhealthy) dichotomy in nutrition but that it can also be condensed into another simple pairing of natural-artificial, as indicated above. Interestingly, there is yet another fallacy in play here, a typical trait of pseudoscience, which is searching for a simple solution to a complex problem. In this case, the complicated field of nutrition is misrepresented by traditionally held beliefs and misconceptions rooted in a simplistic view of the world. It is worth noting that although this particu-

lar fallacy is extremely easy to recognize, the ad populum fallacy prevents it from being adequately dealt with, leading to further propagation of myths.

Another fallacy committed by doctors is the naturalistic fallacy. Despite a similar name, the fallacy is notably different from appeal to nature in that it falsely presupposes that nature is ruled by principles of morality. This leads to the misconception that what is considered natural must be good for the health. Intertwined with the appeal to tradition and the appeal to nature fallacies, this erroneous logic may also lead to doctors failing to recognize the benefits of solutions that may be considered 'artificial' in situations when they are in fact more advisable than those based on natural solutions, i.e. prescribing herbal medicines when there are more potent drugs available that are based on ingredients that were created in the laboratory. (The fact that the latter may also be plant-based is another issue.) In other words, the misconception that 'if something is natural it must be good' is yet another fallacy present in the medical profession, although as for now its existence is only based on anecdotal evidence and it is hard to determine how common it in fact is.

It also needs to be emphasized that the medical profession is prone to a specific type of the ad populum fallacy, i.e. appeal to convention. As Gunderman and Sistrom (2006) point out, identifying the most effective approach to a problem cannot be based on recognizing the most common method of dealing with it. In the case of nutrition, this translates to recognizing actual evidence in place of traditional advice commonly given by medical professionals and thus unquestioned as to its actual veracity.

Considering the issue from a slightly different angle, it can be argued that the specific social nature of settings typical for the medical professions, i.e. hospitals, clinics, universities, etc., is conductive to the ad hominem fallacy. This is visible in the traditionally prestigious position of doctors in relation to other personnel. In the case of nutrition this aspect is important as far as nutritionists and – to a lesser extent – nurses are concerned. In situations when an erroneous dietary recommendation proposed by a doctor differs from the correct one proposed by a nutritionist, the doctor may use the ad hominem argument to force their advice, i.e. implying that being a practitioner of a perceived 'lesser' profession (a nutritionists) does not entitle the person to know the facts when confronted with a doctor. It must be emphasized that this fallacy lies in direct contradiction with the evidence-based approach to medicine as "the argument [must be evaluated] on its own merits" (Gunderman and Sistrom, 2006). Furthermore, in the described scenario, the doctor commits another fallacy, namely appeal to authority, in this case the authority being the doctor themselves, or rather the

medical profession as a whole. The nutritionist, as a fairly young profession, is especially susceptible to be the object of the aforementioned fallacious reasoning.

Conclusions

Although reliance on logical fallacies in situations when a person lacks the necessary knowledge to make an informed, evidence-based decision is an objective phenomenon, the range of its actual occurrence among physicians needs further research. Similarly, in order to recognize the prevalence of particular fallacies, dedicated studies among doctors are needed. Those fallacies that have been recognized by the authors include hasty generalization/overgeneralization, false analogy, appeal to nature, the naturalistic fallacy, false dichotomy, appeal to tradition/convention, argumentum ad populum, and argumentum ad hominem, with the additional underlying issues of equivocation and the availability heuristic. What this paper shows, however, is that the problem of insufficient nutritional knowledge among doctors does exist, as does the phenomenon of not refraining from issuing dietary recommendations despite this inadequacy. It seems, therefore, that in addition to extending the medical curricula in the area of nutrition and a larger reliance on nutritionists in medical settings, there is also the need to incorporate topics connected with critical thinking, especially logical fallacies, in study programmes. This last conclusion is based on the fact that one cannot expect a doctor to possess unlimited knowledge in the vast array of topic they encounter, although they are being expected to. Thus, in order to avoid spur-of-the-moment improvised recommendations, they must be able to recognize situations when their decisions would not be in fact evidence-based and the fallacies they might rely on. To enable them to do it, the curricula must include the necessary critical thinking component. Based on this paper, the authors plan to conduct further research aimed at recognizing the competence of nutritionists and the fallacies committed by medical professionals on the basis of nutritional myths prevalent in the profession.

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