Nutritional Significance of Fish: Exploring the essential nutrients in fish for combating malnutrition

Comment [HNP1]: The nutrients meant to combat malnutrition were not really explored. The nutrients should be stated clearly, functions and mechanisms of action in combating malnutrition. Topic should be modified as " NUTRITIONAL SIGNIFICANCE OF FISH IN COMBATING MALNUTRITION"

ABSTRACT

The nutritional importance of fish in the context of combating malnutrition holds significant potential as a strategic avenue for addressing global health issues. Malnutrition, characterized by deficiencies in vital nutrients, remains a critical concern affecting diverse populations. Fish is a nutrient-dense food source, and investigates its potential contributions to alleviating malnutrition. Wild-caught and aquaculture-derived fish are rich sources of essential nutrients crucial for human health. Abundant in high-quality proteins, fish provides ample amino acids necessary for growth, immune function, and cellular repair. Moreover, fish is renowned for its content of omega-3 fatty acids, including eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), which confer cardiovascular advantages, neurological development, and anti-inflammatory properties. The importance of fish's micronutrients, such as vitamins D and B_{12}, iodine, selenium, and zinc. These micronutrients play integral roles in maintaining bone health, supporting cognitive functions, regulating thyroid activity, and enhancing immune responses. Notably, the bioavailability of these nutrients from fish exceeds that of many plant-based sources, highlighting its potential to address nutrient deficiencies effectively. The versatility of fish consumption across cultural diets and its potential to bridge nutritional gaps for vulnerable populations, particularly in regions with limited access to diverse nutrient sources. As malnutrition is influenced by various socio-economic, cultural, and environmental factors, adopting a holistic approach incorporating fish's nutritional attributes could significantly address this challenge.

Keywords - Nutritional significance; Fish; Essential nutrients; Combating malnutrition; Omega-3 fatty acids.

Introduction

Malnutrition continues to be a prevailing worldwide health issue that impacts diverse socioeconomic groups, significantly impacting personal health and societal progress. This

encompasses a range of nutritional insufficiencies, encompassing disparities in both macronutrient and micronutrient levels, resulting in detrimental health consequences (Amir et al., 2022). The primary emphasis in addressing malnutrition has largely centered on staple foods and dietary variation. Nevertheless, further investigation into the potential of fish, a nutrient-rich reservoir of vital nutrients, is merited for its role in mitigating malnutrition (Gomez and Ricketts, 2013). The capacity of nutrients from fish to alleviate malnutrition and enhance public health is considerable. Malnutrition, distinguished by insufficient consumption or uneven assimilation of nutrients, persists as a significant worldwide issue. Approximately 2 billion individuals are believed to experience micronutrient insufficiencies, severely impacting health, advancement, and efficiency (Burchi et al., 2011). Malnutrition, often observed as stunting, wasting, and underweight, predominantly affects children and expectant mothers in economies with lower to middle incomes. Concurrently, the increasing prevalence of overweight and obesity exacerbates the burden of malnutrition, leading to a double burden(Popkin et al., 2020).

Fish, including finfish and shellfish, occupy a distinct and remarkable role within the spectrum of food resources owing to their abundant array of vital nutrients (Gephart et al., 2020). It serves as an outstanding reservoir of protein, bioaccessible micronutrients, and beneficial fats, thus holding promise as a nutritional remedy for addressing malnutrition. Fish protein is characterized by its completeness, encompassing all indispensable amino acids. Furthermore, it demonstrates enhanced digestibility and absorption rates compared to protein from plant sources (Ewy et al., 2022). Moreover, fish is replete with long-chain polyunsaturated fatty acids (LC-PUFAs) such as omega-3 fatty acids, eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA), which have been associated with cognitive development, cardiovascular health, and immune modulation (Lorente et al., 2015). Regular fish consumption has been linked to enhanced vitamin D levels, especially in areas with reduced sunlight exposure. Furthermore, fish is a significant provider of bioavailable minerals like iodine, selenium, and zinc. These minerals are crucial for thyroid activity, antioxidant protection, and immune modulation (Sharma et al., 2011; Sutherland et al., 2021).

Comment [HNP2]: Give examples of the plant sources.

Comment [HNP3]: Specify those fish sources that are particularly rich in EPA and DHA. Example the cold-water fatty fish.

Comment [HNP4]: Anti-inflammatory potential should be included

Contribution of fish to the provision of animal-derived protein during the period of 2013-15

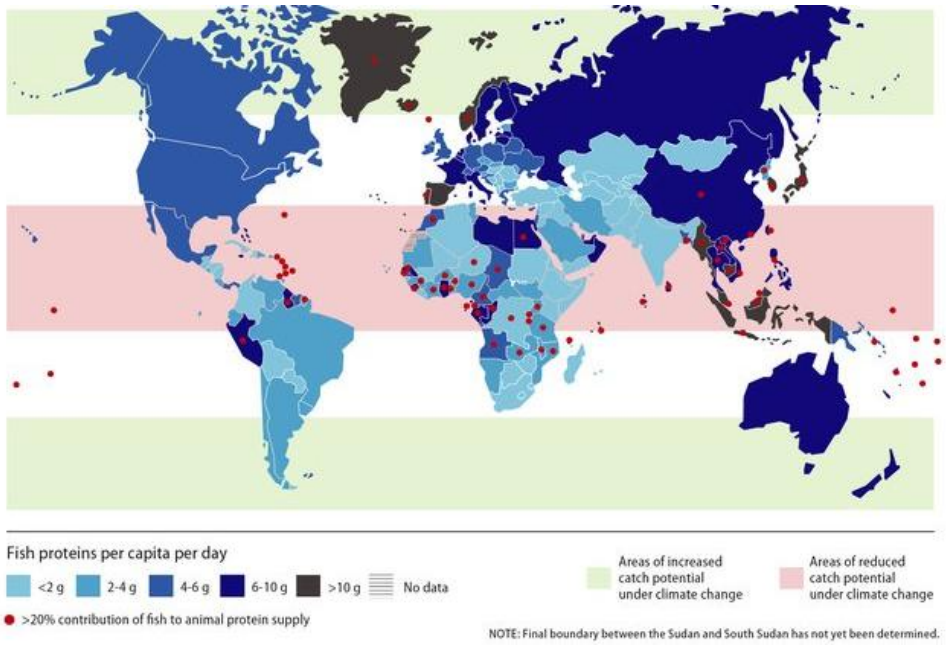

Fig. 1 Illustrating the global provision of animal protein, the map delineates the role of seafood in the supply chain (Troell et al., 2019).

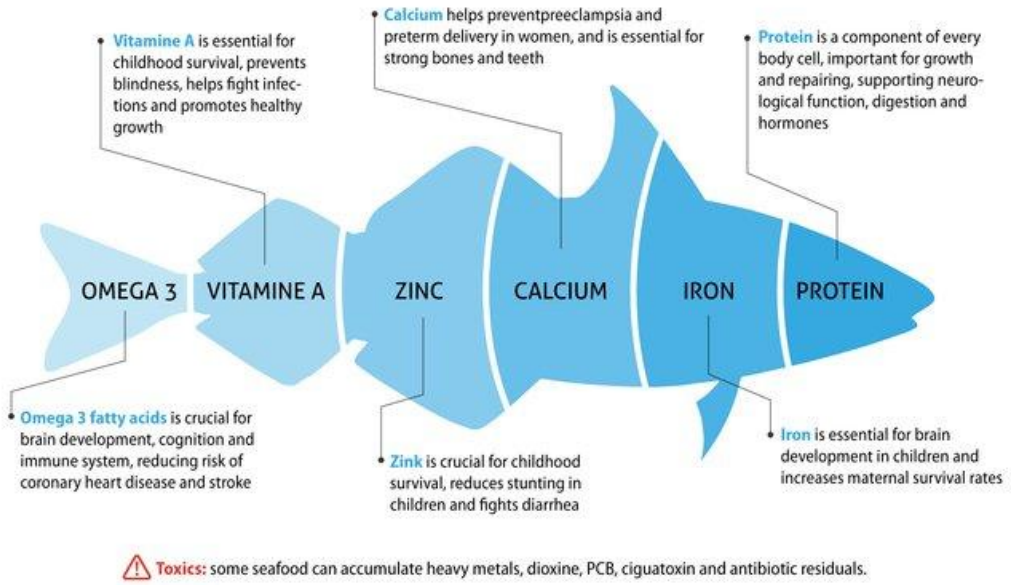

Fig. 2. Illustrating benefits of fish in human nutrition (Troell et al., 2019).

Addressing Malnutrition Through Fish Nutrition

The malnutrition, a considerable worldwide health concern, can be proficiently tackled by including of fish in dietary regimens. Fish, being a nutrient-rich dietary option, offers indispensable proteins, vitamins, minerals, and omega-3 fatty acids. These components are pivotal for fostering optimal growth, cognitive maturation and fortifying the immune system in children (Kwasek et al., 2020; Ghosh et al., 2022). Incorporating fish into the diet of undernourished children has the potential to alleviate protein and nutrient insufficiencies, leading to enhanced weight gain and improved holistic health (Kawarazuka et al., 2010). Moreover, the exceptional digestibility of fish protein renders it well-suited for the delicate digestive systems of children. Omega-3 fatty acids, notably DHA and EPA, are linked to improved cognitive performance and visual aspects of considerable significance in the initial stages of childhood (Castejon et al., 2020; Djuricic et al., 2021).

Comment [HNP5]: In what state should the fish be added to the diet? State clearly if it should be cooked and for how long or if it should be grilled, fried or roasted. It is important to state the method of preparation in order to ascertain the wholeness and stability of the nutrients therein. The amount or quality of nutrients retained after preparation will determine the how much malnutrition has been combated.

Pregnant and lactating mothers necessitate augmented nutrient consumption to facilitate the growth and maturation of their children (Marshall et al., 2022). Fish like salmon, mackerel, and

sardines are rich sources of vital nutrients such as docosahexaenoic acid (DHA), contributing to the advancement of fetal brain and visual growth (Gow et al., 2014). Furthermore, the fish protein facilitates tissue regeneration and augmentation, catering to the escalated demands of gestation and lactation (Ashraf et al., 2020).

In areas with high rates of malnutrition, the addition of fish into dietary patterns can have a profound impact. The inclusion of fish in diets has the potential to mitigate undernutrition by supplying essential nutrients that are frequently deficient. This, in turn, can contribute to enhanced maternal well-being and improved birthing results. Nevertheless, ensuring the safety of fish consumption is crucial due to the potential presence of detrimental levels of mercury and pollutants in certain fish species.

Comment [HNP6]: Explain how the possibility of this challenge can be avoided. Mercury and Lead poisoning are the basic challenges here. How should this be avoided since malnutrition also predisposes one to different illnesses due to poor immune response.

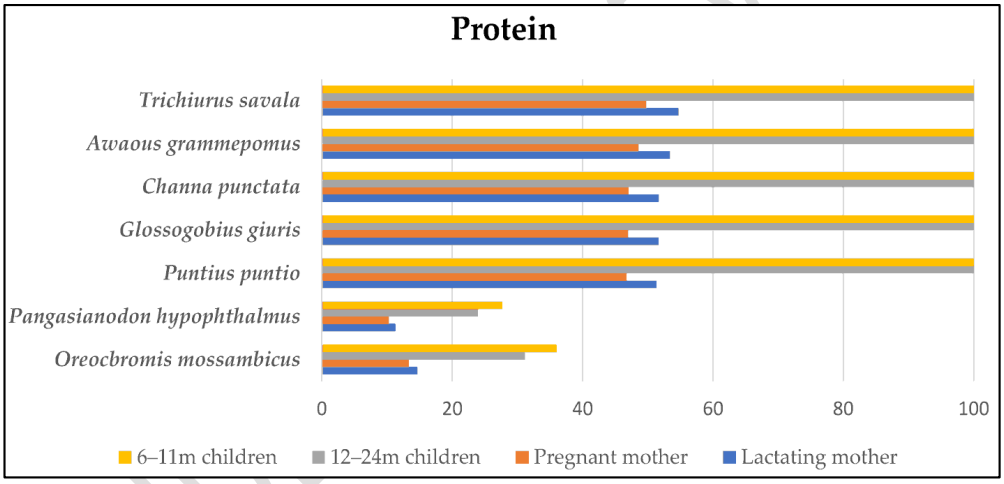

Fig 3. Potential contribution (%) of dry fishes to the recommended nutrient intake (RNI) of protein for children and pregnant and lactating women (Banna et al., 2022).

Nutritional Security and Sustainability

Acknowledging the nutritional potential of fish in mitigating malnutrition necessitates a comprehensive assessment of the wider ramifications associated with heightened fish consumption. The imperative lies in upholding sustainable fishing methodologies and effective aquaculture administration to guarantee the enduring accessibility of fish as a vital nutritional source (Tacon et al., 2009;Colombo et al., 2022). The depletion of fish populations, vanishing of

habitats and pollution of the environment constitute challenges to the availability of fish and, consequently, to nutritional stability. Hence, a comprehensive strategy integrating sensible fisheries management and aquaculture methodologies is vital to attain nutritional objectives while conserving aquatic ecosystems effectively(Delesalle, 2011; Verma et al., 2020; Alava et al., 2023).

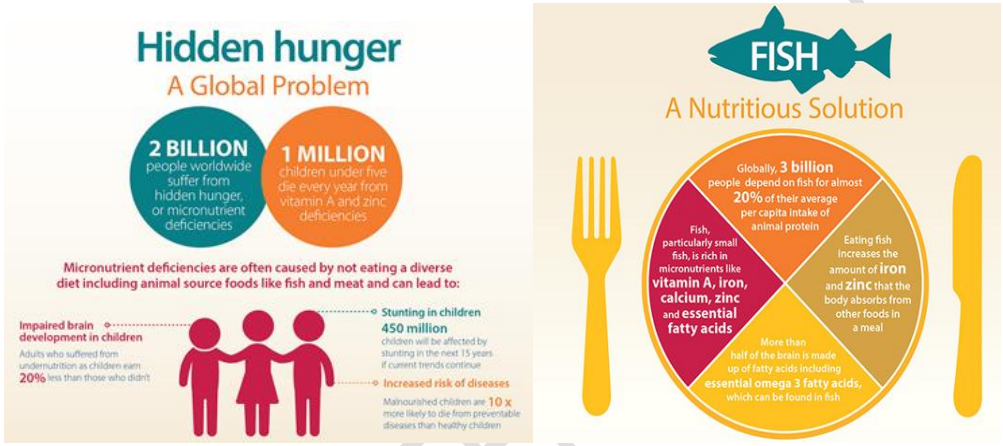

Fig 4. Hidden hunger and fish, a nutritious solution (Source: Worldfishcenter)

Challenges and Considerations

The consumption of fish provides significant nutritional advantages and it is crucial to recognize obstacles such as overfishing, environmental pollutants and problems related to accessibility. Ensuring the enduring availability of fish as a nutritional need the implementation of sustainable fishing methodologies and robust regulatory measures (Cooke et al., 2018;Garcia et al., 2022).Furthermore, it is imperative to undertake activities to enhance the affordability and availability of fish for marginalized populations. These initiatives are crucial in optimizing its effectiveness in addressing malnutrition (Muringai et al., 2021).Cultural inclinations and eating patterns exert notable influence. In locales where fish consumption lacks historical prevalence, advocating for its integration into diets mandates informative initiatives elucidating its nutritional advantages. Furthermore, the imperative to meticulously select and oversee sources arises due to

Comment [HNP7]: How much consumption exactly, is enough to combat malnutrition? How many servings per week according to body size and age?

potential heavy metal and pollutant infiltration in fish, notably prominent in specific larger species.

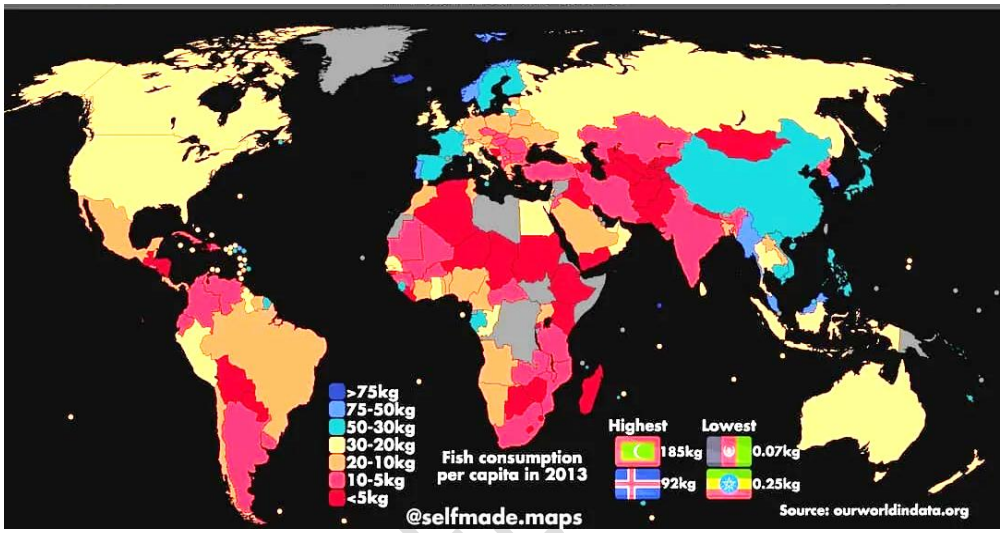

Fig. 5. World fish consumption (2013)

Conclusion

In summary, fisha valuable asset in tackling malnutrition due to its nutrient-dense constitution and concomitant physiological advantages. Investigating the inclusion of fish in dietary interventions and policy frameworks presents a propitious pathway for addressing worldwide malnutrition. Nevertheless, embracing a comprehensive methodology that incorporates principles of sustainability, attainability, and impartial dispensation is imperative to fully exploit the nutritional import of fish in enhancing collective well-being. Additional research is indispensable to elucidate the most advantageous amalgamation of piscine-cantered interventions into intricate programs designed to curtail malnutrition from various angles.

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