# THE PSYCHO-PHYSIOLOGY BEHIND NUTRITIONAL BEHAVIOR, COGNITIVE AND PSYCHOLOGICAL CHOICES, INFLUENCES HEALTH AND WELL-BEING

**Abstract**

Cognition influences nutrition which affects preferences and food choices and, also the time of eating, the quantity of eating,and what types of food we have to eat.Food choice depends on the number of psychological factors that influence the human psyche in different ways.Nutritional behavior in other words we can say behavior to food choices such as eating fast food, only flesh diet, low-fat diet, vegan diet, and cooking with available ingredients.Healthy food choice habits may help in the reduction of risk-associateddiseases such as metabolic disease and also keep the body at its normal body mass index (BMI). But infectious diseases act as resistance to their comfortable life. Infectious disease can cause to hamper the quality of life which may lead to mortality. Psychological status influences the immune system to tackle infectious diseases. In psychological well-being, psychological strengthening plays an important role to improve the body's immune response. To sustain better health and longevity everyone should have satisfaction in life, positive emotion with no negative emotion. A positive psychological state helps to improve mental and physical health as well as build immunity. The main objective of the chapter is to summarize the association between cognitive choice, psychological choice, and nutrition which help in better health and well-being.

**Keyword:** cognitive choice; Meal decision; Psychological choices; Behavior; Nutritional behavior; health well-being

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## I. INTRODUCTION

Cognition influences when, how much, and what we eat, which one by one affects the brain and eating pattern. Cognition influence on nutrition may include “food choice and preferences”, “food habits” and “food perception”[1]. Whereas,the food choice depends on number of complex sets of psychological factors that influencing in a different way to the human psyche. Due to these influences, some products rejected while others are chosen. Food choice is also a relative intake. So that is why in China rice consumption is higher than in the USA but in the USA meat consumption is higher. On the basis of many economic analyses, food intake of particular food is easy to acquire on national basis. It depends on the availability, economic factors and geographic part by their liking and preferences of food. Liking is the most interesting feature in psychology of food choice. So that is why major determinant of preference is liking and major determinant of intake is preferences [2].

“Nutritional behaviors may defined as the type of food choice behaviors such as eating fast food, only meat diet, cooking with available ingredient, the consumption of crustaceans such as lobsters and crabs” [3].Healthy food choice habits may help in reduction of risk associated disease such as metabolic disease and also keep the body at its normal body mass index (BMI). The drinking behaviours include consumption of milk, water and alcoholic and non-alcoholic beverages. Most effective behaviour is eating breakfast, which helps in reduction of metabolic diseases and BMI, but skipping of breakfast may associate with several metabolic disorders.

Human have been always aiming and trying to get comfortable life. Health, longevity and happiness are the characteristics of good life. When people feel emotion of joy they live their life well, and on a sad mood they live badly. Psychology plays an important role in defining human well-being. To sustain better health and longevity everyone should have optimism, satisfaction of life, positive emotions with no negative emotions [4].But infectious diseases are act as resistance to their comfortable life. Infectious disease can cause to hamper the quality of life that may lead to mortality. Psychological status influences the immune system to tackle with infectious disease. In psychological well-being, Psychological strengthening plays an important role to improve body’s immune response[5]. To sustain better health and longevity everyone should have satisfaction of life, positive emotion with no negative emotion. Positive psychological state helps to improve the mental and physical health as well as build the immunity.

According to Cohen et al (2001), literature shows the connection between psychological stress and subduing of humoral immune response which helps in immunization process [6]. Another study shows that, biological and psychosocial factors in progression of disease. Health behavior and stress together influences immune response and neuro-endocrine which ultimately affects health [7].

A study shows the difference in immune response in the patient with Alzheimer’s caregiver and without caregivers. In caregivers group the immune response to acute stress were altered [8]. According to Barak (2006), effect of positive emotion(happiness) has positive effect on physiological parameters like health and on immunity, whereasthe negative emotions may lead to progression of several health disease and autoimmune disorders [9].

 

## II. THE INFLUENCE OF COGNITION ON NUTRITION

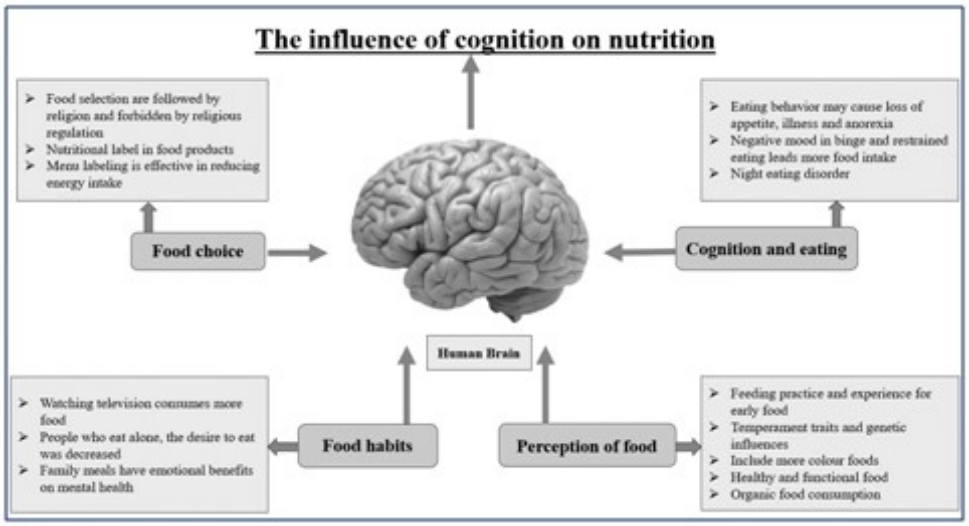


**Figure 1:** The influence of cognition on nutrition

1. **Food Choice:** Food choices focus on psychological and physiological factors along with historical, demographical and cultural factors. Here main focus on health promotion by adapting healthy food behavior.Culture is comprehensive base that underlies all food choices. People follow the rules of their specific culture to accept the food, they choose the food in their combination and that is ideal for them. Western society uses high fat in their diet, this is due to dietary shift toward more energy rich food from grains or starchy food. This is due to taste mediated desires for energy rich diet. Some studies show that central nervous system (CNS) influences the macronutrient composition of the diet by the food choice [10]. In food selection culture and biology together play an important role [11]. Religious based taboos may involve in food consumption. Some regulations in food selection are followed by religion and forbidden by religious regulation. Like in Islam pork, in Hindus beef and flesh food consumption in Buddhist's and Jain's are forbidden [12]. The concept ofThe influence of cognition on nutrition is illustrated in***Fig. 1*****.**

Many people get the information about nutrition and food from the media source. Most money spent on it to advertise the sweet and fat products of packaged and processed foods [13].Some advertisement claims health benefits. Such as Kellogg's cereal package advertise that it's high fiber contain may prevent the cancer and due to this consumers purchase it in high amount [14]. Healthy fast food meal bundle increases liking for fast food in children but not for healthier choice [15].Attitude is another psychological factor influencing food choice and behavior. Attitude may be defined as thoughts of heterogeneous array. Attitude consists of three components- affective, conative and cognitive. Among which principle component is affective attitude. It is noted that attitude towards functional food, transgenic food, novel food and organic food is growing[16]. Family members have positive effect on dietary behavior. This is because, those family member eats in large family have beneficial effect with eating habits in early adolescent, but this is not observed in elderly [17].Nutritional label in food products play an

 

important role in buying decision [18]. Menu labeling is effective in reducing energy intake in both adolescent and in children [19]. Food choice also influenced by health claim related labeling.

2. **Food Habits:** Conscious and non-conscious forces influences how much and when food is eaten. Non-conscious forces influence behavior (hunger). In people of normal weight the unconscious biological force control appetite [1]. Obese persons are prone to external cues like smelling and seeing food [20]. A study shows that people watching television consumes more food than other condition (driving or social). But in the people who eat alone, the desires to eat was decreased and in driving the desires was increased. People watching television while eating their food found less desires than in social eating people [21]. Eating consciously means someone just focused on eating and avoiding anything while having their food. Among three categories, eating consciously behavior is helpful in reduction of abdominal fats and metabolic disorders. It also impact on individual weight gain. Eating carbohydrate food at breakfast or mid-morning decreases fat intake and prevent abdominal obesity [22]. Eating together (eating with family, friend, in parties and sharing food) is also a nutritional behavior. In a study on 29 participants were conducted for 16 weeks. Each participants with at least one metabolic risk factor. Every participant was dining with other. The result found that significant reduction in BMI, wrist size and weight [23]. Family meals have emotional benefits on mental health for depressive adolescent girl. Family play crucial role in management of disease like in obesity, cardiovascular disease and eating disorders with the help of dietary modification like reduction in fat contain in diet [24]. Portion of food and its energy density may influence the behavior. Eating behavior Is the agency with which nutrients enter inside the body and effect on the health, metabolism and overall physiology. With help of dietician any one can improve and reduce the health risk factors like weight management and diabetes [25].

3. **Cognition and Eating:** The amount of activity is the amount of motivated behavior in the hypothalamus at the excitatory centre [26]. So, any change in eating behavior may cause loss of appetite, illness and anorexia. Eating disorder can be happen due to frontal lobe damage, which may cause slow progressive weight gain [27]. Some finding shows that amount of food eaten in previous meal may reduce food intake in later meal. And the amount of food eaten in earlier meal may result more energy in subsequent meal [28, 29].

   A study shows that, negative mood in binge and restrained eating leads more food intake and positive mood in bulimia and anorexia nervosa leads greater food intake [30]. Depression is often allied with weight gain. A study was conducted to assess the effect of psychological eating style (restrained eating, emotional eating and external eating) in weight gain and depression. Result shows that emotional eating was act as moderator between weight gain and depression [31]. Another study shows weight stigma decreases motivation toward dietary pattern and less healthy eating behavior. Negative eating behaviors intern consequence for overall health and well-being [32]. These habits help to control individual appetite and inhibitory function on the behavior. Hunger, external based (smell and appearance of food), eating until feel full and dietary restraint falls in this type of behavior. Abstinent and inhibition behavior effect reduce the metabolic disease risk factors [33].

 

In any psychiatric condition, the mortality rate is higher in anorexia nervosa. It is very common in women. Anorexia nervosa is characterized by weight loss. Anorexia nervosa is the psychological condition in which individual suffers from perceive their body to look slim and attractive but actually individual is suffering from malnourished. Not only psychological but biological and environmental factors may influence anorexia nervosa [34]. Bulimia nervosa is characterized by uncontrolled eating and less exercise. It mainly happens more in women than men. It occurs due to failed episode of dieting [35]. Night eating disorder occurs due to alter in circadian rhythm. At night largest calorie intake occurs in this type of eating disorder. Abnormal weight gain occurs in eating related disorder.

4. **Perception of Food:** Food preference depends on sensory attributes like touch, smell and taste combines together to produce food preference [1].Taste foods also include oral perception and smell of the food texture. Eating habits and food preferences influences the sensory responses on the basis of taste, texture, smell and sight of the foods. Visual appearance also affects the flavor. In one study, the sucked custard with a straw from cup have other flavor than the custard eaten from the surface of cup. This is due to textural properties [36]. Food neophobiamay define asdislike or avoid to eating unfamiliar or uncommon food. It is a characteristic feature of all animal and eating organisms. Such organisms do not prefer to those food that don't have a history of consumption. On that case just prefers the familiar food. There are two factors that influence neophobia-Environmental factors (feeding practice and experience for early food) and Individual factors (temperament traits and genetic influences). And so, visual exposure (include more colour foods) and taste can decreases the neophobia in children [37].A study shows that neophobia scores decreases with both increasing urbanization and increasing education. Men and elderly (60-80 years) were more neophobic than women and other age groups [38].In children food consumption have direct impact of flavour response. The food that they like most, they prefer to eat more those food and they reject the food that have bad taste or not a good texture. But in male link between food consumption, food preferences and taste are less [39]. Obese men mostly prefers meat dishes (combination of fats and proteins), where old women prefers ice-cream, desserts, chocolates and sweet and other mixtures of sugar and fat [40].

Another study shows that colour also affects flavour of food. It influence taste threshold, food preferences, acceptability, sweetness perception and pleasantness [41]. Food perception is also depending upon healthy and functional food. A study was conducted on consumers on willingness to buy healthy product (fat) and pay more. Labeled assessment contains price, nutritional value and identity of product. Where unlabeled assessment showed liking for taste. And main reasons for buying were healthiness of product and not buying was high price. Female and older were having high purchase for healthier and health benefit products [42].A study was conducted to check attitude and beliefs for the organic food consumption. There was positive attitude found toward organic food for their health [43].It was also notices that, if plant foods placed at the beginning in buffet system, then these food were taken first [44].

 

## III. PSYCHOLOGICAL CHOICES AND BEHAVIOR INFLUENCING NUTRITION AND HEALTH

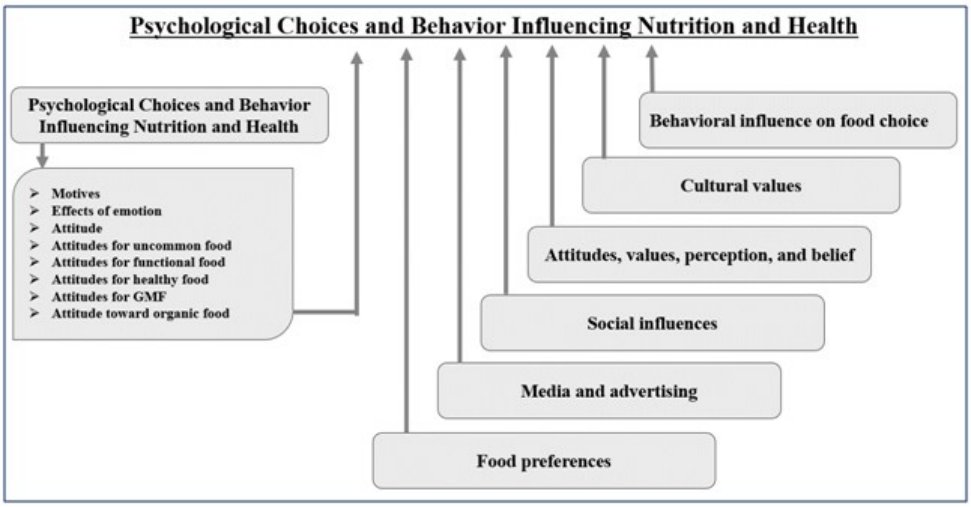


**Figure 2:** Psychological Choices and Behavior Influencing Nutrition and Health

1. **Psychological Influences:** Traditional culture plays an important role in person exposed to for food selection, choice, preferences and experience. **Origin of preferences:** Food preference varies to individual within a culture. This is due to genetic, peer influences, experience with parents and general influences (media). Among which most important parenteral influences because it holds both the early experience and genetic effects.

2. **Acquisition of Preferences (Mere exposure) : "**it is meant a condition making the stimulus accessible to perception" [45]. If someone is involved more in something, his/ her interest will be more on it. Exposure pattern will influence family practice, cultural tradition and more peer preferences.This depends on psychological factors, parenteral influence, genetic dispositions and other [2]. The concept of Psychological Choices and Behavior Influencing Nutrition and Health is illustrated in ***Fig. 2***.

3. **Psychological Factors:** Inappropriate food habits may produce negative effect on human well-being. In food selection, psychological factors such as attitude, motives and personality play a great role [3].

    - **Motives:** The consumer's behavior can be inducing and administer by motives to complete their demands. Motives are of two types rational and emotional. Reasonable behavior is the type of rational motives where spontaneous behavior is responsible for emotional motives. Motives affect the consumer behavior for good well-being. Food faddism is an example of rational motives. Where individual on unhealthy practice and then associated with eating disorders [2, 46].

    - **Effects of Emotion:** There is complex relation between emotional status and food choice. Foods are chosen to decrease depression and restore vigor to improve

 

emotional status. So, food selection depends to individual on his/her current mood. Foods (like coffee, tea, energy drinks and alcohol) play an important role to influence mental freshness and mood. These foods prevent sleepiness, increases energy in the body and restore the body in well-being state. This is due to presence of some stimulating chemical compounds like taurine and inositol [47].It has been demonstrated that when persons in negative emotion they have smaller appetite and take small food but have greater appetite when they have positive emotion.

- **Attitude:** Attitude is another psychological factor influencing food choice and behavior. Attitude may be defined as thoughts of heterogeneous array. Attitude consists of three components- affective, conative and cognitive. Among which principle component is affective attitude. It is noted that attitude towards functional food, transgenic food, novel food and organic food is growing [16].

- **Attitudes for Uncommon Food:** Food neophobiamay define asdislike or avoid to eating unfamiliar or uncommon food. It is a characteristic feature of all animal and eating organisms. Such organisms do not prefer to those food that don't have a history of consumption. On that case just prefers the familiar food. There are two factors that influence neophobia- Environmental factors (feeding practice and experience for early food) and Individual factors (temperament traits and genetic influences). And so, visual exposure (include more colour foods) and taste can decreases the neophobia in children [48].A study shows that neophobia scores decreases with both increasing urbanization and increasing education. Men and elderly (60-80 years) were more neophobic than women and other age groups [38].

- **Attitudes for Functional Food:** The main factors to accept the functional food is that it has positive effect on health [49].Another study shows that attitude toward functional food is due to its health beneficial effect, no side effect, medicinal properties and with good health effect [50]. The study was conducted on female students have shown that some nutritional ingredients were used to supplement the food. It is suggested that the consumers for functional food are basically pregnant women, small children, breast feeding women and older persons.

- **Attitudes for Healthy Food:** A study was conducted on consumers on willingness to buy healthy product (fat) and pay more. Labeled assessment contains price, nutritional value and identity of product. Where unlabeled assessment showed liking for taste. And main reasons for buying were healthiness of product and not buying was high price. Female and older were having high purchase for healthier and health benefit products [51]. Food crises can change behaviour, belief and attitude towards food. These changes have noted when fresh meat was found poison with dioxin in Belgium 1999 [52].

- **Attitudes for GMF:** The acceptance for genetically modified food (GMF) was hardly seen in consumers. This research reported that majority of experimental groups were negative attitude for GMF [53]. A study was conducted on Argentine consumers to their perception regarding GM food. And consumer having their age under 25, low

 

educated people and those consumers who have not heard about GM food have higher purchase. So, perception to buy GM food in men was much more than women [54].

- **Attitude Toward Organic Food:** A study was conducted to check attitude and beliefs for the organic food consumption. There was positive attitude found toward organic food for their health. Positive influence for perceived benefits and negative influence for perceived risk [43].

4. **Behavioral Influence on Food Choice:** Food choices focus on psychological and physiological factors along with historical, demographical and cultural factors. Here main focus on health promotion by adapting healthy food behavior.

5. **Cultural Values:** Culture is comprehensive base that underlies all food choices. People follow the rules of their specific culture to accept the food, they choose the food in their combination and that is ideal for them. Western society uses high fat in their diets; this is due to dietary shift toward more energy rich food from grains or starchy food. This is due to taste mediated desires for energy rich diet. Some studies show that central nervous system (CNS) influences the macronutrient composition of the diet by the food choice [10].

6. **Attitudes, Values, Perception and Belief:** People build their attitudes, values, perception and belief among which psychological factors help to choose their food. The cultured construct of food may not be scientifically safe or have high nutritious values [55].

7. **Social Influences:** We mostly like to eat our food in presence of others like friends, families and relatives. Research indicates that social influence effect leads to low level of food consumption when we eat alone and high level of food consumption in group, especially when the group is with familiar people. We mostly enjoy our foods in social gathering like in marriage ceremony, festivals and at the time of birthday parties [56]. Family play crucial role in management of disease like in obesity, cardiovascular disease and eating disorders with the help of dietary modification like reduction in fat contain in diet [57, 58].

8. **Media and Advertising:** Many people get the information about nutrition and food from the media source. Most money spent on it to advertise the sweet and fat products of packaged and processed foods [13]. These foods are not beneficial towards health, but companies misguide the consumers about the nutritional level promote them to buy the products. Negative impact of advertising is deals with psychology of persons, advertisement of tobacco and beers may influence the young and school children to smoke and drink [59, 60]. Some advertisement claims health benefits. Such as Kellogg's cereal package advertise that its high fiber contain may prevent the cancer and due to this consumers purchase it in high amount [14].

9. **Food Preferences:** Consumers shows their preferences of food on the basis of their taste, nutrition and food safety. Taste foods also include oral perception and smell of the food texture. Eating habits and food preferences influences the sensory responses on the basis of taste, texture, smell and sight of the foods. In all geographical, cultural and ethics

 

boundary high energy food s are basically preferred. Salt, sugar and fats mostly preferred by adults under psychological control. Where soft texture, less spicy and hot drinks by elders and sweets, desserts and crispy foods by children [2, 61, 62].In children food consumption have direct impact of flavour response. The food that they like most, they prefer to eat more those food and they reject the food that have bad taste or not a good texture. But in male link between food consumption, food preferences and taste are less [39].Food preference varies by gender. Obese men mostly prefers meat dishes (combination of fats and proteins), where old women prefers ice-cream, desserts, chocolates and sweet and other mixtures of sugar and fat [40].

## IV. RELATIONSHIP BETWEEN NUTRITIONAL BEHAVIOR AND HEALTH/WELL-BEING

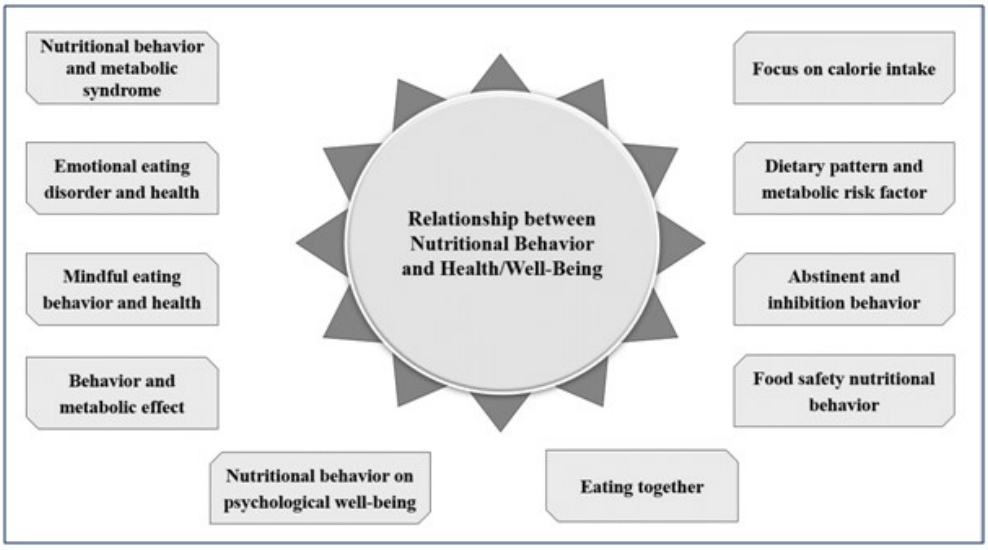


**Figure 3:** Relationship between Nutritional Behavior and Health/Well-Being

1. **Nutritional Behavior and Metabolic Syndrome:** Poorly eating habits leads to several diseases.Chronic diseases such as diabetes, cardiovascular disease, non-alcoholic liver disease and metabolic syndromes may prevent or cure by life style change and nutritional behavior. Energy restricted diet, slight modification in diet such as consumption of Mediterranean diet and physical activity helps in weight loss and in prevention of metabolic syndrome [63]. School children feeding pattern are some-time poorly balanced, irrational and irregular that causes excess BMI that lead to other disease and metabolic syndrome [64].A study was conducted in Korea on eating staple food (rice). In postmenopausal women, the group eating just white rice have more risk of metabolic syndrome, in compare with group having rice with beans and multigrain [65].The Relationship between Nutritional Behavior and Health/Well-Being is illustrated in ***Fig. 3***.

Where, healthy diet pattern declines metabolic syndrome and other clinical condition. Avoiding high fat, high sugar and low fibre diet may lower the risk of

 

cardiovascular and other mortality [66]. Behaviour-related pattern also allied with metabolic syndrome [67].

2. **Emotional Eating Disorder and Health:** A study shows that, negative mood in binge and restrained eating leads more food intake and positive mood in bulimia and anorexia nervosa leads greater food intake [68]. Depression is often allied with weight gain. A study was conducted to assess the effect of psychological eating style (restrained eating, emotional eating and external eating) in weight gain and depression. Result shows that motional eating was act as moderator between weight gain and depression [31]. Another study shows weight stigma decreases motivation toward dietary pattern and less healthy eating behavior. Negative eating behaviors intern consequence for overall health and well-being [32].

3. **Mindful Eating Behavior and Health:** Mindful eating behavior includes eating emotionally, fast eating and eating consciously. Two abnormal habits are indicated in eating behavior – Eating until feeling full and fast eating. Eating habits truly affect daily life. The study revealed that Participant who eating until feeling full have excess food intake than their requirement and lead to over-nutrition. But risk factors in rapid eating participants were also not less. In rapid eating participants metabolic risk was extremely rare. This was because in rapid eating, they overeat before their satiety signal by brain. So, People having their breakfast and lunch more rapidly due to work pressure. If they do not change their habits of rapid eating in breakfast and lunch, they will not change their habits greatly at dinner. These eating habits may lead impaired lipid profile, high blood pressure and fatty liver [69].

   Eating consciously means someone just focused on eating and avoiding anything while having their food. Among three categories, eating consciously behavior is helpful in reduction of abdominal fats and metabolic disorders. It also impacts on individual weight gain.Eating carbohydrate food at breakfast or mid-morning decreases fat intake and prevent abdominal obesity [22].

## V. BEHAVIOR AND METABOLIC EFFECT

Healthy food choices habits may help in reduction of risk associated disease such as metabolic disease and also keep the body at its normal BMI. Metabolically obese normal weight (MONW) subjects are group of individuals having normal BMI and body weight but shows obesity related abnormalities. The study was conducted on 3050 Korean adult females of age 20 years. The aim of the study was to analyse the relation between metabolic syndrome and diet pattern. The study advice that low intake of carbohydrate and carbohydrate like snacks may reduce the MONW risk [70]. Another study was conducted to assess the association between mortality and serum phosphorus level in fasting individual. Result shows that phosphorus level in individual was higher in less fasting and lower in more fasting. More fasting serum phosphorus level was associated with mortality [71]. Pubertal stage and physical activity were associated with risk of obesity and overweight, but dietary pattern were not in adolescent, age 10 to 12 years [72]. In a study dietary modification with vegan diet may reduce blood lipids (triglycerides) and oxidative stress but in postprandial response there was no such reduction in oxidative stress [73].

 

Change in meal habits would have negative effect on metabolism. In a study showed skipping breakfast adversely effect on eaters. This is because skipping breakfast may increases high insulin and fatty acid response on lunch which increases hunger but not satiety [74]. In another study, it shows that eating habits like eating and skipping breakfast have great effect on BMI change with physical activity [75].

## VI. FOCUS ON CALORIE INTAKE

Study shows that control on calorie intake can reduce the metabolic disorders and helps in well-being. Consuming diet rich in vegetable and fruit interns with better health related behavior, lower BMI and higher socioeconomic status. But eating meat may cause lower quality of life, higher chronic diseases and increases vascular risk [76]. Change in nutritional behavior help to improve overall health and well-being due to cut-off in calorie intake. It also helps to maintain the intestinal micro-flora which reduces future chronic disease.

## VII. DIETARY PATTERN AND METABOLIC RISK FACTOR

“Three dietary patterns (traditional, prudent and modern) were used to assess metabolic risk factor on the basis of indicators (such as C-reactive protein, fasting glucose level, serum leptin, cholesterol: HDL ratio and TAG:HDL-cholesterol ratio). The traditional dietary pattern had negative and indirect effect on these factors (TAG:HDL-cholesterol ratio, cholesterol:HDL ratio and fasting glucose) and negative and direct effect on these factors (waist circumference and body weight). The prudent dietary pattern has direct and negative effect on systolic BP but on modern dietary pattern no risk factor was observed. Those who following both traditional and prudent diet have negative impact on metabolic risk factor”[77].

A dietary pattern consists of high amounts of cereals, whole grains, fruits, vegetables, poultry, fish and low dairy-fat products have beneficial effect over health. It increases quality of life and nutritional status [78]. In Saudi adult female were have more Risk of metabolic syndrome due to dietary imbalance practice. Study indicates that selected dietary nutrient intake for carbohydrate, protein, vitamins and minerals were low and associated with high risk of metabolic syndrome [79].Another study shows that consumption of weight germ for 12 week decreases the serum total cholesterol and no effect on malondialdehyde in type-2 diabetes mellitus and other metabolic variables [80].

1. **Abstinent and Inhibition Behaviour:** These habits help to control individual appetite and inhibitory function on the behavior. Hunger, external based (smell and appearance of food), eating until feel full and dietary restraint falls in this type of behavior. Abstinent and inhibition behavior effect reduce the metabolic disease risk factors[81].

2. **Food Safety Nutritional Behaviour:** Food safety is also a part of nutritional behavior. In this individual choose the food as per their safety. Individual avoid eating hot food and in school cafeteria. This is because of unhealthy practice used by school cafeteria. These behaviors avoid eating unhealthy food and reduces the metabolic risk factor and maintain the health well. School children having their feed in cafeteria are often poorly balanced, irregular and irrational and have higher body mass [64, 81]. Consumption of unhealthy

 

foods may cause higher depressive symptom and healthy food consumption may cause lower depressive symptom. So, consumption of healthy food may result to reduce stress and depressive system [82].

Message about safety/health can effectively change eating behavior (like intention, involvement and attitude) in factual term, where message about growth/well-being can change eating behavior in pre-factual term. So, in elder people appropriate message can effectively promote eating habits about meat consumption [83].

A high consumption of inulin type fructans may increases the tolerated dietary fibre which may improve nutrition/ food related behavior. Inulin type fructans increases gut micro-flora which in turn improves health [84].

3. **Nutritional Behavior on Psychological Well-Being:** The study was conducted in China to assess the association between food preferences and food (like salty snacks, fast food and sweetened beverages) with psychological well-being. Food preferences are closely related with psychological well-being. So, preferences regarding these foods are not always associated with poor psychological health but also related with psychological well-being [85]. Food insecurity rise poor emotional health risk.

4. **Eating Together:** Eating together (eating with family, friend, in parties and sharing food) is also a nutritional behavior. A study was conducted for a period of 16 weeks, on 29 participants. Each participant had at least one metabolic risk factor and was dining with other. The result found that significant reduction in BMI, wrist size and weight [23]. Family meals have emotional benefits on mental health for depressive adolescent girl [24].

## VIII. PSYCHOLOGICAL HEALTH, AND OVERALL WELL-BEING, BUILD IMMUNITY

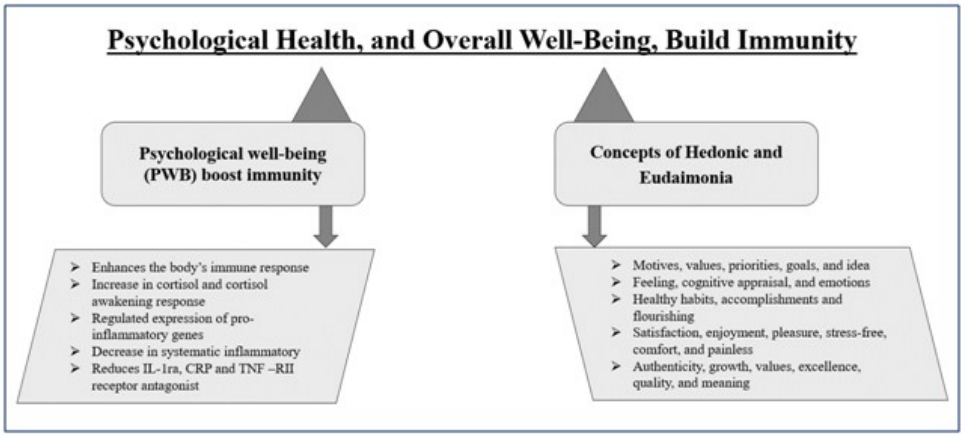


**Figure 4:** Psychological Health, and Overall Well-Being, Build Immunity

1. **Concepts Of Hedonic And Eudaimonia:** There are two term to understand clearly the concepts of well-being are “categories” and “content”. These are described below

[86].Well-being categories: According to Huta and Waterman (2014) literature review, these are four categories. Orientation: It includes motives, values, priorities, goals and idea that help to choose the behavior. Behavior: It deals with actual activities that someone involves in (parties attending). Experience: It involves feeling, cognitive appraisal and emotions. Functioning: It includes healthy habits, accomplishment and flourishing.Well-being content has been categorized in two parts, first one hedonic and second one eudaimonic. Hedonic: It involves satisfaction, enjoyment, pleasure, stress free, comfort and painless. Eudaimonic: It involves authenticity, growth, values, excellence, quality and meaning. The concept of Psychological Health, and Overall Well-Being, Build Immunity is illustrated in ***Fig. 4***.

## IX. PSYCHOLOGICAL WELL-BEING (PWB) BOOST IMMUNITY

1. **Based on Many Studies:** Psychological well-being shows a positive effect on health as it enhances the body's immune response. Immune response increases with increase in cortisol and cortisol awakening response (CAR) are increased. CAR allied with mental distress but less in positive functioning. So, CAR is act as indicator for increasing immune response in adult [87, 88]. "Research in human social genomics has identified a conserved transcriptional response to adversity (CTRA) characterized by up-regulated expression of pro-inflammatory genes and down-regulated expression of Type I interferon- and antibody-related genes. This report seeks to identify the specific aspects of positive psychological well-being that oppose such effects and predict reduced CTRA gene expression" [88].

   The hypothetical test was conducted on parenteral empathy and found beneficial in both physiologically and psychosocially to the children. As we know that health improves when there is increase in immune response. There was decrease in systematic inflammatory sign by measuring C-reactive protein (CRP), interleukin (IL)-6 and interleukin (IL)-1-ra in blood sample. Better emotional regulation effect the empathy from parent to teens. The effect of empathy makes parent more self-conceit and get to know the motives of his life. These findings show better physical and psychosocial condition if there is mutual cohesion and sightedness. The effect of empathy was found more effective when it involves in medical services [89].

   The Eudaimonic well-being (Growth, purpose and social embeddedness) have co-relation to health. This research was conducted over 106 male Japanese workers. CTRA gene expression was used to check the role of PWB in immune response development by obstructing the inflammatory and viral response [90].

   The hypothetical clinical test was conducted to evaluate how psychological intervention reduces the cancer risk. By using indicator T-cell proliferation and natural killer cell cytotoxicity demonstrate that PWB has great role to renovate in immune response [91]. Zhao et al (2016) was using free cortisol and CD3+, CD4+, CD8+ and CD4+ and CD8+ ratio in serum to find the effect of PWB in immune response [92]. Another study was conducted on level of phagocytes. Phagocytes are the inflammatory response which helps in wound healing process and enhance the immune system. Phagocyte deficiency may lead to low the immunity which may result poor wound

 

healing, systemic infection and hospitalization. But PWB increases the immune system by reducing phagocyte deficiency [93].

A study was conducted on the 50-cancer patient of age 17-69 year, the effect of music and singing. Result revealed significantly less anxiety and tension and more vigor. So, music has potential effect on promoting vigor and relieving tensions[94]. Another study was conducted to assess the psychosocial intervention can improve psychologically to cancer patient. Fancourt et al, (2016) were examined in the cancer patient the effect of music and singing on stress, mood and immune response. They used oxytocin, cortisol, ten-cytokines and β-endorphin as an indicator from saliva. And study proved that music and singing could improve mood and boost the immunity [95]. Stress affects interlinkage between endocrine pathway, immune system and central nervous system. Music can denominate positive mood and then PWB on acute stress. In this study leptin, tumor necrosis factor-α (TNF-α), interleukin (IL)-6 and somatostatin immune function mediator were used and nor-adrenaline and two hypothalamic- pituitary adrenal axis hormone (cortisol and ACTH) were used as indicator from serum level. In group drumming, it was found an increased level of cortisol,IL-4,IL-17, IL-6 and cytokines, TNF-α and monocyte protein chemo-attractant (MCP)-1 were elevated in saliva sample. It is done by improving mental health and well-being, body increases immune response [96].

A study was conducted on breast cancer patient to assess the impact of hypnotic guide imagery. It proves that psychological treatment could alter the immune system positively in natural killer cell [97]. Another study was conducted in people suffering from HIV/AIDS to boost immune responses by religious coping (RCOPE) and social support with the help of PWB. CD4+ cell counts were used to prove this finding [98]. In inflammatory bowel disease, religious coping increases the health related quality of life (HRQoL), better medication adherence and reduces psychological distress [99]. Another study was conducted to assess the effect of affective arousal a part of PWB in the breast cancer patient. Plasma inflammation includes IL-1ra, CRP and TNF –RII receptor antagonist. In the breast cancer patient, affective arousal effects inflammatory process [100].

Taoist Qigong is a part of traditional Chinese medicine (TCM) used in health maintenance and to improve immune cell count. It is a mind body method which involves meditation, breathing and slow body movement. For quantification of immune parameters, indicators were obtained from blood. The NK-cell, monocyte, eosinophil, neutrophil, B-lymphocytes were used as parameters in number and percentage. In the experimental group B-lymphocytes were higher and lower in NK-cell as compared to control group. This study shows that Taoist Qigong was effective toward PWB in delivering immune-modulatory effect in immune response [101].

Many studies show that PWB upgrades the immune function but psychological ill-being could disturb it also. Distress act as trigger that disturb the body equilibrium and make the body more susceptible toward disease [102].

Several studies examine the effect of negative and positive mood with immune outcome of antibodies secretory immunoglonulin-A (slgA). The slgA level was higher on positive mood. Whereas, theslgA level was lower in negative mood [103, 104].

 

Another study shows that depression could reduce the pro-inflammatory cytokines production that can influence aging, osteoporosis, cardiovascular disease, type-ii diabetes, arthritis, weakness, periodontal disease, cancer and functional decline. Study reveals that excess stress could reduce cellular immune response, which is responsible for prolonged healing time of wound and infection and burns healing [105].

Psychological ill condition such as chronic stress could reduce immune system and increases viral infection. “According to Martin-Subero et al, (2006) was found immune-inflammatory disorder, nitrosative stress and oxidative converts into depression and lead to morbidity. Both nitrosetive stress (NS) and inflamatory oxidative (IO) increases inflamatory cytokine e.g, interleukin-1 (IL-1) and tumour necrosis factor-α, IL-6 trans-signalling; Th-1- and Th-17-like responses; neopterin and soluble IL-2 receptor levels; positive acute phase reactants (haptoglobin and C-reactive protein); lowered levels of negative acute phase reactants (albumin, transferrin, zinc) and anti-inflammatory cytokines (IL-10 and transforming growth factor-β); increased O&NS with damage to lipids, protein’s and DNA; increased production of nitric oxide (NO) and inducible NO synthase; lowered plasma tryptophan but increased TRYCAT levels; autoimmune responses; and increased bacterial translocation” [106].

In reproductive system, emotions and moods can influences conception. Stress can significantly reduce conception in pregnancy, through sympathetic modular pathway [107]. Positive emotions provide better quality of life. Positive experience can be assessed by using indicators vocalization, facilitative behaviors and play [108].

## X. CONCLUSION

The chapter has discussed the influence of cognition on nutrition such as Food choice, Food habits, Cognition and eating, and Perception of food. It also describes broadly the psychological factors such as Motives, Effects of emotion, Attitudes toward uncommon food, Attitudes toward functional food, Attitudes toward healthy food, Attitudes towards GMF (genetically modified food), and Attitudes toward organic food. It also included the Behavioral influence on food choices such as Cultural values, Attitudes, and beliefs towards food, social influences, Media and advertising, and Food preferences. Last but not least it also included the Relationship between Nutritional Behavior and Health/Well-Being such as Nutritional behavior and metabolic syndrome, Emotional eating disorder and health, Mindful eating behavior and health, Behavior and metabolic effect, focus on calorie intake, Dietary pattern and metabolic risk factor and Psychological Health, and Overall Well-Being, Build Immunity.

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