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Effect Of Food Additives On Hormonal Imbalance In Children And Its Impact On Health – A Review

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Abstract: Food additives are the chemical substances that are added to the food and beverages to maintain their shelf life, taste, appearance or texture in form of taste makers, preservatives, colorants, antioxidants, acidity regulators, thickeners, stabilizers, emulsifiers, anti-caking agents. Their need in the food processing industry has risen dramatically as a result of customer preferences and the economic benefits they bring to produced foods, such as longer shelf life, consistent composition, and processing ease. On the other hand, they have been linked to a variety of health issues, including allergies, asthma, cancer, metabolic changes and behavioural abnormalities in children. Artificial food colours (AFCs) are added to drinks and snacks for appealing purposes. The use of Bisphenol A in infant bottles and sippers was banned by the FDA, however, it has been substituted by bisphenol S, which possesses identical genotoxicity and estrogenicity as Bisphenol A. Nitrates and nitrites are used as preservatives particularly in meat products; phthalates, which are used to produce plastic packaging; and bisphenols, which are used in the lining of metal cans for canned food goods, are among the chemicals that have caused concern. Perfluoroalkyl compounds (PFCs), being used in grease-proof paper and packaging, and perchlorates, an antistatic agent used in plastic packaging, certain hormone injections given to animals in order to improve muscle mass of meat are of major concern for children. They may disrupt endocrine system of children, causing hormonal imbalance. As a result, growth and development of the child would be affected. They act as blockers of the certain growth hormones responsible for development of brain and sex organs. They also interfere with hormones required for normal metabolic functioning and therefore leading to childhood obesity or poor immunity. In conclusion, children should eat homemade fresh food preparation to avoid ingestion of harmful chemical substances through food contamination so as to grow healthy and have better physical and mental well-being.

***Index Terms*- hormonal imbalance, food additives, endocrine system, metabolic functioning**

INTRODUCTION

Food additives are the chemical substances that are added to the food and beverages to improve or maintain their shelf life, taste, freshness, appearance or texture. They are being used as taste makers, preservatives colorants, antioxidants, acidity regulators, thickeners, stabilizers, emulsifiers, anti-caking agents. These food additives have been in use since primordial times. The oldest evidence of food additives may be found in Ancient Egyptian papyri from around 1500 BC [1]. For millennia, food additives like salt (in meats or dried nuts), oil and salt combination to preserve vegetables in form of pickles, or in form of brine solution or vinegar solution, sugar (in marmalade, jams, crushes), and sulphur dioxide have been used to preserve food (in wine). The need for food additives in the food processing industry has risen dramatically as a result of customer preferences and the economic benefits they bring to produced foods, such as longer shelf life, consistent composition, and processing ease. Nonetheless, food science and technology have progressed rapidly in recent decades, resulting in an increasing variety and quantity of food additives. Food additives, on the other hand, have been linked to a variety of health issues, including allergies, asthma, cancer and behavioural abnormalities in children. As a result, regulatory authorities and law enforcement agencies have established restrictive regulations governing the licencing and control of food additives. The International Joint FAO/WHO Expert Committee on Food Additives (JECFA) is in charge of examining the safety of food additives. Only food additives that have been tested and certified safe by JECFA, and for which the Codex Alimentarius Commission has determined maximum usage levels, can be used in globally traded foods.

The problem statement for this study is food additives have been linked to a variety of health issues, including allergies, asthma, cancer, metabolic changes and behavioural abnormalities in children. They disrupt endocrine system of children, causing hormonal imbalance. As a result, growth and development of the child would be adversely affected. They block the certain growth hormones and diminishes growth and development of the child. They also alters normal metabolic functioning of the body and causing hormonal imbalance leading to childhood obesity or poor immunity.

DISCUSSION

Synthetic artificial food colours (AFCs) are added to drinks and snacks for appealing purposes, and the vividly coloured food items that are particularly attractive to young children such as colourful sugar candies. In other circumstances, like as in fruit juice beverages that contain little or no genuine fruit, AFCs are used to replace nutritious components. Over the last several decades, studies have raised concerns regarding the effect of AFCs on child behaviour and their role in exacerbating attention-deficit/hyperactivity disorder symptoms [2].

BPA is classed as a "endocrine disruptor" because it may attach to the oestrogen receptor and triggers tissues to act as if estradiol is present [3]. Also in human epidemiologic studies, it is shown that BPA exposure has been linked to a variety of endocrine-related end goals, including lower fertility [4], changed puberty timing, alterations in mammary gland development, and the progression of neoplasias [5]. BPA in environmental levels can disrupt pancreatic-cell function, activates the conversion of the cells into adipocytes, and also affects transportation of glucose to adipocytes. Prenatal BPA exposure has been linked to negative neurodevelopmental outcomes, and cross-sectional studies have linked BPA to foetal growth decrements, childhood obesity, and low-grade albuminuria. In a cross-sectional investigation, it has been found that diet of pre-schoolers may contain up to 99 percent of BPA through the medium of dust in indoor and outdoor air, and solid and liquid [6]. The use of BPA in infant bottles and sippy cups was banned by the FDA [7], however, it has been substituted by similarly comparable alternative, called as bisphenol S, which possesses identical genotoxicity and estrogenicity as BPA [8].

Phthalate esters are used in a wide range of consumer items and may be divided into two types: Low–molecular weight phthalates which are commonly used to preserve scent in shampoos, cosmetics, lotions, and other personal care products, while high–molecular weight phthalates are used to make vinyl plastics for a variety of applications, including flooring, clear food wrap, and flexible plastic tubing often used throughout food manufacturing. Di-2-ethylhexylphthalate (DEHP), which belongs to the high-molecular-weight group, is of special importance since DEHP-containing plastics are extensively used in industrial food processing [9]. The metabolites of phthalates have been associated with oxidative stress according to laboratory studies. Oxidative stress appears to reduce insulin-dependent stimulation of insulin-signaling elements and glucose transport activity, as well as change the endothelial relaxant nitric oxide, which promotes vasoconstriction, platelet adhesion, and the release of proinflammatory cytokines like interleukin-1. As a result, these effects may affect metabolic health. DEHP may potentially cause arrhythmia, alter metabolic profiles, and cause cardiac myocyte malfunction, according to new animal research [10]. Then DHEP was replaced with diisononylphthalate (DINP) and diisodecyl (DIDP) whose urinary metabolites were detected in 98% of population in 2010 National Health and Nutrition Examination Survey (NHANES) data [11]. DINP and DIDP are commonly used as food additive and metabolite concentrations are linked to insulin resistance and systolic blood pressure z scores in children and adolescents, according to cross-sectional data from the National Health and Nutrition Examination Survey (NHANES) from 2009 to 2012 [12].

Perfluroalkyl compounds are chemically synthesized fluorinated chemicals with exceptional stability and heat resistance due to their carbon–fluorine linkages. In food packaging industries PFCs are being used in stain-resistant sprays for non-stick cooking surfaces, and grease-proofing of paper and paperboard. According to NHANES data, PFCs such as perfluorooctane sulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorohexane sulfonic acid (PFHxS), and perfluorononanoic acid (PFNA) have been detected in the blood samples. Although exposure to PFOS and PFOA can occur through skin contact and inhalation, most people are exposed to them through contaminated food. Exposure to PFOA and PFOS has been linked to negative health consequences such as a diminished immunological response to vaccinations, metabolic changes, and low birth weight [13]. PFCs' endocrine-disrupting potential is also causing worry; studies have connected PFOA and PFOS to lower fertility and thyroid alterations. With half-lives ranging from 2 to 9 years in the human body, these chemicals are likewise exceedingly enduring and bioaccumulative [14]. The FDA banned the usage of three kinds of long-chain PFCs as indirect food additives in January 2016 and they are diethanolamine salts of mono- and bis (1*H*,1*H*,2*H*,2*H* perfluoroalkyl) phosphates, pentanoic acid, 4,4-bis [(γ-ω-perfluoro-C_{8-20}-alkyl)thio] derivatives and perfluoroalkyl substituted phosphate ester acids [23]. Short-chain PFCs with physically comparable structures, such as PFHxS, may, nonetheless, continue to be employed. Although research on the human health effects of short-chain PFC exposure are lacking, their structural closeness to prohibited chemicals implies that they may likewise represent a concern to humans [15].

Perchlorate is a food additive that is used indirectly. Contamination in food occurs when it is employed as an antistatic agent in plastic packaging and comes into contact with dry foods that don't have free fat or oil (such as sugar, flour, and starches) or when hypochlorite bleach used as a cleaning solution in the food industry contaminates and degrades the food. It usually finds its way into the food supply as a pollutant in water or as a component of nitrate fertilisers [16]. Perchlorate is known to interact with the sodium iodide symporter (NIS), causing thyroid hormone synthesis to be disrupted [16]. Thyroid hormone is important for brain development and other functions in early life, and changes in normal hormone concentrations can have long-term cognitive implications. Children may be exposed to high levels of perchlorate from packing materials when they consume powdered formula. Perchlorate and other dietary pollutants that disrupt thyroid hormone homeostasis, such as polybrominated diphenyl ethers, might be playing a role in the rise in newborn hypothyroidism and other thyroid system disturbances. Furthermore, thyroid hormone is

required for normal development processes, and current research reveals that high levels of various substances that interfere with iodide absorption are linked to poor growth results [18].

The use of nitrates and nitrites as preservatives in cured and processed meats, fish, and cheese has long been a source of concerns. Because of the chemical makeup of their gastrointestinal tracts, newborns are particularly sensitive to methemoglobinemia caused due to nitrates and nitrites, according to a 2004 statement from the American Medical Association. In addition, the American Medical Association statement underlined the possibility of gastrointestinal or neurological cancer from nitrates and nitrites, which, while not carcinogenic in and of themselves, may react with secondary amines or amides in the body to generate carcinogenic N-nitroso compounds (NOCs) [19]. Processed meat (meat that has been salted, cured, or otherwise treated to increase flavour and preservation) was classed as "carcinogenic to humans" by the International Agency for Research on Cancer in 2015 [20]. High maternal nitrite-cured meat consumption has also been related to an increased incidence of infantile brain cancers, particularly astroglial tumours. Nitrate and nitrite preservatives may also be present in packed celery powder, and labelled as "organic" and "natural" [21]. These goods may include levels of nitrates and nitrites that are comparable to or higher than those found in standard sodium-based products. Nitrates, like perchlorate, can affect thyroid function by inhibiting critical iodide absorption by blocking the NIS. Nitrate is still a substantial problem, despite its lower relative efficacy than other frequent NIS inhibitors [22].

CONCLUSION

In conclusion, processed foods may contain harmful levels of food additives or if not, prolonged consumption of processed or packaged foods can increase levels of harmful chemicals substances in the body. This may alter endocrine system of children and may interfere with his growth and development. It is better for children to reduce or eat no processed, packaged or outside food and encourage children to eat homemade fresh food preparations. Fresh homemade food will not only be free from food additives but also will be free from trans or hydrogenated fats which will reduce their chances to get non-communicable diseases/metabolic disorders in their later life stage.

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