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CS Swetha

Assistant Professor, Department of Veterinary Public Health and Epidemiology, College of Veterinary Science, Sri Venkateswara Veterinary University, Tirupati, Andhra Pradesh, India

R Annie Supriya

Assistant Professor, Department of Veterinary Public Health and Epidemiology, College of Veterinary Science, Sri Venkateswara Veterinary University, Tirupati, Andhra Pradesh, India

A Jagadeesh Babu

Professor, Department of Veterinary Public Health and Epidemiology, College of Veterinary Science, Sri Venkateswara Veterinary University, Tirupati, Andhra Pradesh, India

T Madhava Rao

Professor and University Head, Department of Veterinary Public Health and Epidemiology, College of Veterinary Science, Sri Venkateswara Veterinary University, Tirupati, Andhra Pradesh, India

Correspondence

CS Swetha

Assistant Professor, Department of Veterinary Public Health and Epidemiology, College of Veterinary Science, Sri Venkateswara Veterinary University, Tirupati, Andhra Pradesh, India

A survey on the public awareness about harmful effects of artificial food colours in milk and meat products on human health

CS Swetha, R Annie Supriya, A Jagadeesh Babu and T Madhava Rao

Abstract

Food colours are the substances that were added to enhance the aesthetic appearance of foods which make them more attractive and increases the appetizing value of food products for consumers especially children. Excessive use of permitted synthetic food colours may cause serious health hazards, gastrointestinal diseases like cholera, enteric fever, TB etc. Hence, the present study was mainly aimed to know the awareness among the consumers about the harmful effects of excessive use of permitted and non-permitted food colours in milk and meat products. A survey was conducted with 100 respondents of different age groups with different educational qualifications. The present study revealed that 89% of the respondents were aware of harmful effects due to excessive use of artificial colours; out of which 86% were aware that they are mutagenic and potential carcinogenic which will fall under the category of good percentage of awareness.

Keywords: Natural colours, artificial colours, harmful effects, carcinogenic

1. Introduction

The Codex Alimentarius Commission has defined 'Food Additive' as any substance not normally consumed as a food by itself and not normally used as a typical ingredient of food, whether or not it has nutritive value, the intentional addition of which to food for a technological (including Organoleptic) purpose in the manufacture, processing, preparation, treatment, packing, packaging transport or holding of such food results or may be reasonably expected to result (directly or indirectly) in it or its by products becoming a component or otherwise affecting the characteristic of such foods [5]. Based on the functional use, food additives are grouped as colours, preservatives, acidity regulators, antioxidants, anticaking agents, antifoaming agents, artificial sweeteners, enzymes, emulsifiers, emulsifying agents, flavours, flavour enhancers, modified starches, phosphates, stabilizers, thickening and jellying agents.

Food colours are pigments, dyes or any other compound which were added to food products for various several reasons like identification of various products, to preserve the attractive and colourful appearance, to make them more tempting [14], to enhance the appetizing value and the palatability of food products [10]. FDA classified food colours under 2 basic categories i.e. colours which require certification and those which do not require certification [2, 4].

The colouring matter in food may be natural and synthetic colours. They may also classify as water soluble and oil soluble. Natural food colours are colours which were extracted and isolated from different plants and animals [1]. Natural colours include chlorophyll, carotenes, canthaxanthene, riboflavin, annatto, saffron, turmeric, curcumin, caramel etc. Synthetic food colours are categorized under those colours which need certification in FDA classification [14]. Though there are no harmful effects on usage of high amount of natural food colours in foods but they are less stable, less bright, very expensive and difficult to find exact shade required for different food products [1]. Due to their specific properties such as intense colour, uniform colour, cheap and easy blending, synthetic food colours are widely used in modern food industry as important adjuncts [14].

Synthetic food colours are again classified as acidic and basic dyes. As they are showing toxic effects on humans, Central Committee for Food Standards (CCFS, India) has been constantly updating the food regulations [12]. As a component of these regulations, certain food colours like Amaranth and Fast red E were banned and recommended to reduce the usage of synthetic food colour limit from 200 to 100 ppm in all food products except in canned foods, jams and

jellies. The number of synthetic food colours usage varies in different countries. USA permits only seven, European Union is permitting to use sixteen synthetic food colours whereas in India only 8 coal tar food colours are permitted to use in certain food products under provisions of PFA. They include 3 red shades namely Carmosine, Ponceau 4R, Erythrosine; 2 yellow shades namely Sunset yellow FCF, Tartrazine; 2 blue shades i.e. Brilliant Blue FCF and Indigo Carmine and 1 green shade i.e. Fast Green FCF. The unpermitted food colours are Metanil yellow, Rodamine B, orange G, Blue VRS, Auramine and some water soluble and oil soluble food colours. Now-a-days, both industrial and non-industrial sectors in most of developed as well developing countries are involved in different food processing activities [12]. Though the industrial sector is subjected to quality checks but the non-industrial sector is outside of quality checks, statutory controls [12] resulting in increased production of substandard food products which is affecting human health and leading to indirect financial burden on national economy [10]. Because of rapid urbanization, consumption of food products including milk products, meat products and bakery products like cakes, confectionaries is increasing and the production of these products in non-industrial sector is two to three times more than the industrial sector [17].

Many studies and surveys have revealed that food colours are the major source of food intoxication [1]. Even though some synthetic food colours are permitted, the indiscriminate consumption is not safe which may lead to higher incidence of gastrointestinal diseases like cholera, enteric fever, TB etc. The other non-permitted food colours may pose serious health hazards as they are mutagenic and potential carcinogens [1]. The maximum limit of permissible colours to be added in any food shall be 0.1gm/kg of food.

To evaluate safe level usage of food colour, the Joint FAO/WHO Expert Committee of Food Additives (JECFA) has set an Acceptable Daily Intake (ADI) for each food colour [13]. The ADI has defined as the amount of substance that can be consumed everyday throughout the lifetime of an individual without any appreciable adverse health effects [6].

Many studies have been reported on the use of permitted and non-permitted colours in foods in India and revealed the fact that use of non-permitted colours are known to cause adverse effects in experimental animals and humans [12]. As there are fewer reports on awareness on usage of synthetic food colours, therefore a survey was conducted regarding harmful effects on usage of artificial food colours in milk products and meat products among the educated community in and around Tirupati city, Chittoor district of Andhra Pradesh.

2. Materials and Methods

2.1 Objective and design of the study

The main objective of this survey to gauge the percentage of awareness and to edify about harmful effects of synthetic food colours which were commonly and excessively used in milk and meat products on human health both in adults and children.

2.2 Study area and population

The study was conducted in and around the region of Tirupathi, Chittoor district, Andhra Pradesh and the target population mainly consisted educated community of different age groups with different education levels like under graduate, graduate and post graduates of different professions.

2.3 Sampling method

A simple random sampling method was employed to select the respondents. Evaluation method including a well-designed interview and questionnaire is in English language. Respondents were selected based on education level and profession during questionnaire in different areas of Tirupathi region. The interview was conducted on 100 respondents; out of which 63 were students, 23 were teachers and 13 of them belong to different professions. The initial part of the questionnaire covered the respondent's demographic information which included name, age, sex, level of education and occupation. The second section included the questions that can evaluate the frequency of consumption of milk and meat products with artificial colours and percentage of awareness among public about harmful effects including cancer which will occur after consuming such products.

2.4 Data management and analysis

Data was collected by using questionnaire and interviews to evaluate the awareness among respondents about harmful effects including carcinogenicity by excessive using of synthetic food colours in food.

3. Results and Discussion

A total of 100 people of different genders belonging to different age groups with different educational qualifications and in different professions were selected for this present investigation. The demographic characteristics of respondents were summarized in the table 1. Among the total 100 respondents, 54% were males and 46% were females out of which 63% were students, 23% were school teachers and 14% were from different professions.

The present study also revealed that percentage of consumption of milk products (66%) is more than percentage of consumption of meat products (24%) (Figure 2). The frequency of consumption of milk products and meat products with artificial colours was represented in Figure 3. Among the respondents, 37 % of them were falling in the very often group and 8% of them were fell under none category in the consumption of milk products. Whereas 25% of the respondents revealed that they consume meat products once in a week which is similar to findings of Supriya *et al.* (2016) [18] and Lilian (2015) [7] and 31% of the respondents disclosed that they never consumed meat products from outside which is similar to findings of Supriya *et al.* (2016) [18] and the present results were very low when compared with findings of Raju and Suryanarayana (2005) [15] who reported 65% of the consumers are not preferring to consume meat products. Among the total respondents, 89% of them were aware of harmful effects due to artificial colours out of which 86% of respondents were having the knowledge that artificial colours are also mutagenic and potential carcinogenic (Figure 4).

Table 1: Demographic characteristics of the respondents

| Demographics | | % |
|-----------------|-------------------|----|
| Sex | Male | 54 |
| | Female | 46 |
| Age | 18-24 yrs | 72 |
| | 25-34 yrs | 21 |
| | 35-49 yrs | 19 |
| Education level | Under graduates | 67 |
| | Graduates | 14 |
| | Post Graduates | 19 |
| Occupation | Students | 63 |
| | Teachers | 23 |
| | Other Professions | 14 |

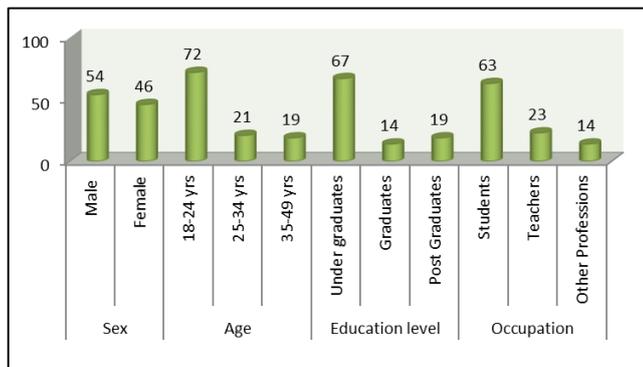


Fig 1: Demographic characteristics of the respondents

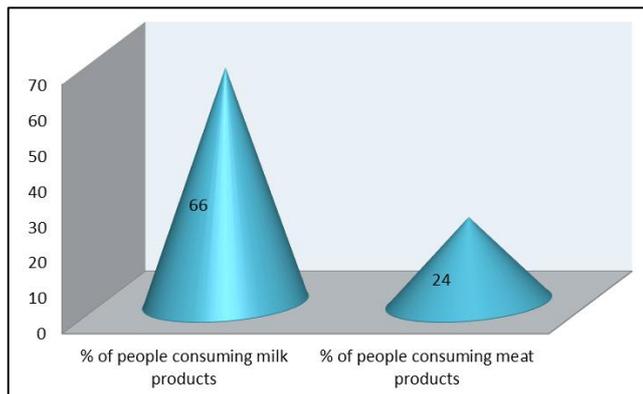


Fig 2: Representation of percentages of consumption of milk and meat products (n=100)

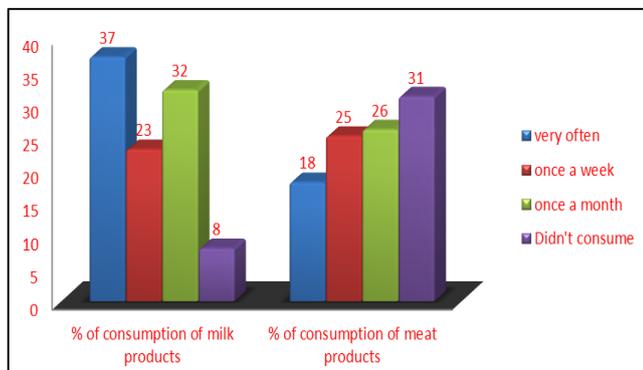


Fig 3: Representation of frequency of consumption of milk and meat products (in %)

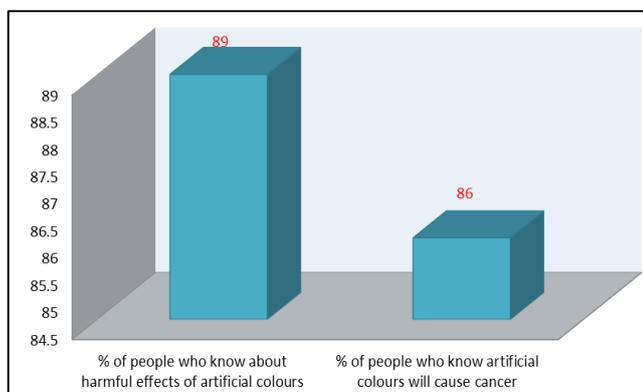


Fig 4: Representation of percentage of awareness among the people on usage of artificial colours

The health hazards due to consumption of food colours have also been reported by FAO/WHO in 1994. Nish *et al.* 1991 [11]

also reported in his studies that consumption of certain natural colours like annatto exhibited anaphylactic reactions. Beardowin and Kanny (1995) [3] also reported food anaphylaxis in a woman after ingestion of carmine which a natural dye extracted from cochineal insects at a dose of 1mg/kg bodyweight though the ADI of carmine is 0-5mg/kg body weight.

Though Tartrazine is a permitted yellow colour which is a commonly used sugar confectionery has also exhibited irritability, restlessness and sleep disturbances in a topic or hypertensive children aged between two and fourteen years (Rowe and Rowe, 1994) [16] and Wuthrich (1993) [20] also reported a typical case of anaphylactoid purpura associated with tartrazine in his studies.

World Health Organization, 1991 [19] reported that allergic responses vary from urticaria to dermatitis, angio-oedema and exacerbation of asthmatic patients after consumption of non-permitted food colours. Even at low intake of some permitted colours like ponceau 4R, sunset yellow have aggravated allergic reactions in several individuals (Lockey, 1997) [8]. National Institute of Nutrition (1994) [9] reported that consumption of a brand of aniseed having very high levels of ponceau 4R exhibited symptoms of glossitis in children.

4. Conclusion

The present study results revealed that frequency and percentage of consumption of milk products with artificial colours is high than that of meat products with synthetic food colours. Among the respondents, a good percentage of people were having awareness about the harmful effects on human health especially about carcinogenicity by excessive intake of synthetic food colours. From the previous studies, it was confirmed that whether natural or synthetic colours can induce wide range of adverse reactions in sensitive individuals and some of non-permitted colours may be considered as carcinogenic in nature. As prevention is better than cure, it is essential to implement or enforce certain rules or laws to evaluate the frequency of using toxic non-permitted colours as well as permitted colours and also to prevent ill effects of using both synthetic colours (non-permitted colours) and permitted colours above permissible levels. It is better to keep vigilance on children by parents as well as teachers to prevent consumption of coloured foods from local vendors outside their schools.

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