

**MICRONUTRIENT STATUS OF THE SELECTED  
TRANSGENDERS**

**DEEPIKA.P  
(17PFN002)**

A THESIS SUBMITTED TO THE  
AVINASHILINGAM INSTITUTE FOR HOME SCIENCE AND  
HIGHER EDUCATION FOR WOMEN (DEEMED UNIVERSITY)  
COIMBATORE - 641 043

IN PARTIAL FULFILMENT OF THE REQUIEMENTS FOR THE DEGREE OF  
**MASTER OF SCIENCE IN FOOD SCIENCE AND NUTRITION**

**APRIL 2019**

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**Certified as a Bonafide Research Work**

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22/4/19

Signature of the Head of the Department

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**CHAPTER I**  
**INTRODUCTION**

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## **I INTRODUCTION**

**Being Transgender is not just medical transition, its discovering who you are, living your life authentically, loving yourself and spreading that love towards other people and accepting one another no matter their difference**

**- Jazz Jennings**

The term Trans Gender(TG) was first coined by psychiatrist John.F.Olives in his Sexual Hygiene and Pathology (1965).By 1976 the term Trangenderist was abbreviated as TG in educational materials.The transgender community has an age old history in India and in Hindu mythology.According to Hindu mythology, the supreme beings of Lord Shiva and Goddess Parvathi joined and emerged as the almighty Ammaiappan, these divine beings combine to take the form “half male and half female”- Arthanaareeshwara. And henceforth the androgynous formation of the god was worshipped as god in the form of human (Pavithra,2012).

This is evident on seeing the transgender to be the royal guard in the Mughal period. Their sanctioned place was then altered by British colonial period which remains to be the same till date.They are ostracized by loved ones and harassed by general public (Nanda,1996).

In the world, the transgenders are estimated to be 600 crores, there are roughly one million Hijra in India, representing approximately one in every four hundred post pubertal persons born male. Eight in 10 transgender subjects are verbally harassed and 4 in 10 transgender subjects are physically harassed. Eighty percent of transgender

individuals felt unsafe at school because of their gender expression. The transgender population in Tamil Nadu would be roughly about 22,364 and 4,87,803 in India (MSJE 2014).



A transgender is biologically a boy but there is transformation in their physical and psychological characters as for a girl (preferred to be addressed as a woman). Transitioning is a process in which there is a change of one's gender presentation/sex characters to accord with one's internal sense of gender identity(Julie,2014).

A common symbol for the transgender community is the transgender pride flag, which was designed by Monica Helms, and was first shown at a pride parade in Phoenix, Arizona, United States in 2000. The flag consists of five horizontal stripes, two light blue, two pink, with a white stripe in the center. The light blue is the traditional color for baby boys, pink is for girls, and the white in the middle is for those who are transitioning, those who feel they have a neutral gender or no gender, and those who are inter sexed. The pattern is such that no matter which way one fly it, it will always be correct. This symbolizes to find correctness in one's own life. Other transgender symbols include the butterfly (symbolizing transformation or metamorphosis), and a pink/light blue yin and yang symbol.

**Genetic causes:** H – Y antigen has very important role in sex determination but their role in masculinization and feminization is unknown. There are few chromosome corroborations for male to female transsexuals *i.e.*, 46 XY chromosomes (Pauly, 1969; Hoenig and Torr, 1964; Hoenig, 1985).

Female children with adrenogenital syndrome who have been exposed to androgen before and after the birth will show boyish behavior but will not necessarily become transsexual (Ehrhardt *et al.*, 1968). Polycystic ovarian disease has been reported more in female to male transsexuals (Bosinski *et al.*, 1997). However, very few patients with ovarian condition will have gender identity disorder (Green, 2000).

An anatomical study (Zhou *et al.*, 1995) examined the structure of 6 brains of male to female transsexuals post-mortem and found the size of the nucleus to be similar to that of women. However, it was criticized by Green (2000) as artifactual (scientific observation showing naturally decrement of the size) shrinkage of the nucleus (Gelder *et al.*, 2004).

Transsexual phenomena could be similar to somatoparaphrenia, distortions in superior parietal lobe which also explain the symptoms of transsexuality wherein MTF (male to female transsexuals) feel the penis as redundant and FTM (female to male transsexual) may have similar experiences of having phantom penis or erection (Ramachandran, 2010).

Psychological theories of transsexualism are twofold. Transsexualism is a symptomatic expression and an actual gender identity in its own right without underlying conflicts (Derogatis *et al.*, 1978; Kilmann, 1984). Early upbringing: critical period during the childhood which is until three years is very important as child's gender role orientation is determined irrespective of biological sex (Money and Ehrhardt, 1972; Kilmann, 1984). However these perspectives still continue to be hypotheses and are not proven as theories.

Gender role refers to the culturally defined set of behaviors that are considered sex appropriate within the given society. Thus the behavior considered appropriate to one society need not be so in another society. Gender identity and gender role are socially known. But, once acquired, gender identity almost never changes, whereas gender role may change. Since gender identity is learned, chances of taking wrong gender identity are also there. Hence, there are certain unusual cases in which sex and gender identity do not match. It is felt that they should dress up and behave according to their identity and not according to their sex. Some have gone even further and have changed their sex through surgery and hormone treatment (Subramanya, 1999). Sex roles are characteristics behaviour and skills that are defined within a specific culture as being either masculine or feminine (Tiefer and Kring, 1995; Emery and Oltmanns, 2001).

Identity itself is pluralistic and important (Costa-Pinto, 2006). A person has to make choices considering the implications and one's own competing and preceding requirements. Identity becomes essential and Amartya Sen (2006) says that identifying oneself with others in various contexts becomes extremely important for living in a society. Such identity could be based on sexuality issues like sexual orientation and the gender that is homosexual or heterosexual in the former and identity of being male, female or other in the latter. Gender Identity refers to individual's sense of themselves as being male or female, which may or may not be the same as the person's biological sex (Public Health Agency of Canada, 2008). Gender identity could be person's internalized, deeply sensed and felt being of female or male or the other which may not be congruent with biological sex (Brill and Pepper, 2008). Gender identity must be distinguished from sex roles or gender roles (Tiefer and Kring, 1995; Emery and Oltmanns, 2001).

Sexual orientation is the extent to which a person is erotically attracted to members of the same or opposite sex (Halgin and Whitbourne, 2003). It is the preference for sexual partners of one gender or the other. This is divided into heterosexual and homosexual orientations (Lindsey, 2011). Most people will have clear orientation to pursue sexual activity with members of the other sex, but some are attracted to members of the same sex and yet few others are attracted to members of both sexes. Constancy of sexual orientation is typical but not universal; some people change over a period of time and due to circumstances (Halgin and Whitbourne, 2003). Like gender identity, sexual orientation is not present or could be designated at birth by the biological sex. Transgenders are described as people who do not conform to culturally defined traditional gender roles associated with their sex. Transgender people may or may not identify themselves as homosexual and may or may not choose to "pass" for the other sex in appearance (Lindsey, 2011). It is important to recognize that both sexual orientation and gender identity are thus social identities, comparable to race or ethnicity, around which human beings can organize themselves and around which hatred and prejudice can adhere (International Gay and Lesbian Human Rights Commission, 2001).

People with Gender Identity Disorder (GID), commonly called Transgender or Transsexual individuals, are physically normal with respect to their biological sex. In other words, a transsexual has a gender identity which conflicts with his or her biological sex (Frude, 1998;Green, 2000). These people have pervasive and persistent feeling of having been born into the body of the wrong sex.This feeling causes so much discomfort that in adulthood, people with GID may take sex hormones and undergo sex change surgery (Green, 2000).Transgender typically is used to designate any individual whose gender identity does not confirm to the conventional conceptualizations of the genders like “male” or “female” or mixes different aspects of male and female role and identity (Diamond *et al.*, 2011).

Transitioning from one gender to another is a complex process and may involve transition to a gender that is neither traditionally male nor female. People who transit often start by expressing their preferred gender in situations where they feel safe. They typically work up to living full time as members of their preferred gender by making many changes a little at a time.While there is no ‘right’ way to transition genders, there are common social changes, transgender people experience that may involve one or more of the following: adopting the appearance of the desired sex through changes in clothing and grooming, adopting a new name, changing sex designation on identity documents, if possible, using hormone therapy treatment and/ or undergoing medical procedures that modify their body to conform with their gender identity.

The transition of every transgender person differs. Because of this, many factors may determine how the individual wishes to live and wishes to express his / her gender identity.

Recognition of sex reassignment is prevalent to quite an extent in the western countries. Definitive guidelines are seen in the European context. Gender reassignment goes on for few years to lifetime.Whole gamut of treatment comprises hormonal treatment, electrolysis, voice therapy, cosmetic surgery etc. Psychological adjunct treatment comprise therapy based on the merit of the case and is at clinician’s discretion (Kilmann, 1984).

The sex reassignment surgery is of two types, as for Male To Female (MTF) may be phallectomy (removal of penis), orchiectomy (removal of testicles), vaginoplasty (creation of vagina) and implantation of breasts and for Female To Male (FTM) may be mastectomy (removal of breasts), hysterectomy (removal of uterus) and phalloplasty (penis creation). Not all transgender people desire these treatments and some cannot undergo them for financial/medical reasons (Kotula, 2002).

In addition to the word *transgender*, a variety of subordinate terms have been adopted by transgender people to characterize their gender identities. These include *trans man*—meaning one who has transitioned to live as a man—*trans woman*, and *nonbinary*, which connotes a sense that one is not strictly a man or a woman. MTF Male to Female (MTF) and Female to Male (FTM) are the two gender identities which have been widely noted in transgender literature and the terms include ‘Hijra’, ‘Hijda’, ‘Kothi or Koti’, ‘Kinnar’ (in Urdu and Hindi), ‘Chhakka’ (Kannada), ‘Khusra’ (Punjabi), ‘Kojja’ (Telugu), ‘Janka’ or ‘Pavaiyya’ (Gujrathi), ‘Durani’ (Kolkata), ‘Menaka’ (Cochin in Kerala), ‘Thiranangai’, ‘Aravani’ or ‘Aruvani’ (Tamil), ‘Mcti’ (Nepal), ‘Zenana’ (Pakistan), ‘Kothey’ (Thailand), ‘Xanith’ (Oman), ‘Tommy Boys’ or ‘Lesbian men’ (Africa), ‘Eunuch’ or ‘Hermaphrodite’ (English) and ‘Baklas’ (Philippines) (Nanda, 1999)

There are many types of transgender present which are classified as FTM, MTF, cross-dresser, drag kings, drag queens, two spirit and gender queers. They undergo long and arduous journey rejecting her biological sex and opting to become a hijra. Transsexual is a person whose gender identity does not match the sex they were assigned to at birth. Many transsexuals seek to alter their bodies through hormones and surgery. FTM and MTF: Abbreviations for “female to male” and “male to female” transgender or transsexual persons, respectively. Cross-dresser is a person who enjoys dressing in clothes of the opposite sex; this may or may not also include a degree of exploration into gender identity. Drag Queens and Drag Kings is a person who performs femininity or masculinity theatrically. Two-Spirit is a term that refers to transgender traditions of some Native American cultures; such traditions varied among groups. Gender Queer is a gender-variant person whose gender identity is neither male

nor female, is between or beyond genders, or is some combination of genders (Boenkeet *al.*,1999).

Most of the transgender face discrimination in the workplace and in accessing public accommodations and healthcare. In many places they are not legally protected from discrimination. Many programmes and benefits are available for transgender people in Tamil Nadu. They are

- ❖ Self-employment grants (up to INR 20, 000) to small business entrepreneurs
- ❖ Vocational training (e.g., jewellery-making, tailoring)
- ❖ Material support for self-employment (e.g., sewing machines)
- ❖ Short-stay home for transgender people in crisis
- ❖ Individual grants
- ❖ Access to employment opportunities by registering in state government 'employment exchange'
- ❖ IAY (Indira Awaas Yojana) - Subsidies or Grants for constructing houses
- ❖ Education grants
- ❖ To support education of transgender youth
- ❖ Free health insurance
- ❖ Free Sex Reassignment Surgery (SRS) in select government hospitals
- ❖ Ration/Food cards (Public Distribution System) (TGWB,2008)

In April 2014, the supreme court of India declared transgender to be third gender in Indian law. In March 2015, the option 'E'(enuch) was added to the passport application form apart from male and female. Inspired by the supreme court judgement in February 2014 politician Trichy Siva has formulated a bill comprising of the rights to a transgender. The transgender should be accepted when they change their identity, equal rights to visit any public place, all transgender irrespective of their caste should be bought to OBC but no change for SC/ST (for reservation quota for jobs), all applications should have male/female /transgender option, Constitution of fundamental rights (right to equality, life, property, personal liberty) and human rights should be provided without discrimination; educational admission, scholarships, hostel accommodation should not be denied, anti-discrimination cell should be present in the institutions which provide

education for transgender, priority to take complaints in police stations and if injured should take to the rehabilitation centres, Government should provide employment and safety measures for anti-discrimination, Government loans (with surety, leniency in giving loan) should be provided and government must assist financially the transgenders who wish to be entrepreneurs. This Bill is passed from Rajya Sabha to Lok Sabha with some rejections in its quotation and is awaited to be signed by our Honourable Prime Minister to be passed as a law in our country and the punishments for violating this law is yet to be quoted. This is the constitutional base of a transgender.

Theoretical formulation is the base of every research to discuss the present and future perspectives of the research gap under investigation. So it is necessary to build/adopt a theoretical framework so as to ensure logical and scientific procedures in inquiring into the problem and its solutions.

This study aims at unraveling the micronutrient status of the selected transgenders in Coimbatore and Tirupur city. Emotional changes have an impact on the food consumption pattern. They have inadequate nutrients as they are subjected to rejection, racism and lack of medical health care. Transgender people may eat more or skip meals leading to malnutrition, obesity and other nutritional complications. They have less usage of drugs and used no steroids.

The importance of nutrition in their life is highly accepted by them. Dietary habits posed to be pleasing as most of them avoided junk foods and opted for natural foods. On some faulty food consumption habits, they showed willingness to make corrections in some of their dietary patterns.

Hence the present study **“Micronutrient Status of the Selected Transgenders”** is undertaken with the following objectives to:

- ❖ study the socio-economic status of selected transgender
- ❖ find out the lifestyle pattern of selected transgender
- ❖ elicit the dietary habits of transgender
- ❖ assess the micronutrient status of the transgender

- ❖ create awareness among transgender regarding concepts of nutrition and health and
- ❖ study the physical and mental health status of transgender

**The first step towards change is awareness.**

**The second step is acceptance**

- **Nathaniel Branden**

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## CHAPTER II

# REVIEW OF LITERATURE

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## **II REVIEW OF LITERATURE**

The Review of Literature pertaining to the study “**Micronutrient Status of the Selected Transgenders**” is discussed under the following headings:

### **2.1 General information about transgender**

#### **2.2 Health status of transgender**

#### **2.3 Nutritional emphasis of transgender**

### **2.1 General information about transgender**

#### **2.1.1 Introduction**

In India, there are about 5-6 million transgender living, nearly 30,000 are in Tamil Nadu and 5,550 reside in Coimbatore city (Express India, 2013). Transgender people are those who cannot or choose not to conform to societal gender norms based upon their physical or birth sex. They undergo sex reassignment therapy and are classified as trans men and trans women (Jessica *et al.*, 2007).

In the late 1990's transgenderism emerged as a significant research topic, with long-term research projects carried out by ethnographers in countries such as Brazil (Kulick, 1998), Philippines (Johnson, 1997), Tonga (Besnier, 1997), and among Native Americans (Lang, 1998). Major work on transgender theory and practice includes the works of Feinberg 1996 and 1998; Ekins and King 1997; Bornstein 1994 and Atkins 1998. Then the research on sexuality of transgender was considered to be serious

since Ellis' (1897/1923) which was the path breaking work on sexual variation and Freud's (1905/1964a) documentation on the nuances and contradictions of desire of transgender were done. Among the early ethnographers B. Malinowski, M. Mead, G. Devereux, W. Hill, R. Landes, VanBaal reported various substantive forms and practices of sexuality of the transgender.

Subsequent to Kinsey's (1948, 1953) sex survey, Ford and Beach (1951) found the diverse articulations of sexuality around the question sex and / or gender. With regard to human homosexuality, they found that the male form of homosexuality was widespread. Responding to the continued lack of ethnographic attention paid to homosexuality, Sonenschein challenged the scholarly community with his essay, "Homosexuality as a Subject of Anthropological Inquiry" (1966).

According to Rosalind Morris, Hijra becomes "a drag queen" who [is] a hero [ine] in a global sexual resistance (Morris 1994). As with any other community in India they are crosscut by a range of other axes that shape their identities (Reddy, 2005, 2007). Cohen (1995) studies Hijras and commented on castration as castration of desire. He stated about Jankhas and Zenanas (similar toKothis) as "men who sometimes dress like women and dance like Hijras but do not select castration" (Cohen,1995).

The ethnographic evidence of other researchers like Naqvi and Mujtaba (1997) confirm the comparison of Hijras and Zenanas in Pakistan similarly, in which Hijra version of the Zenanas include "We are certainly not the same. Zenanas are in just for the dhanda (business)". The works byVanita (2002), Vanita and Kidwai (2000) have also explored non-heterosexual sexuality in India. These studies concentrate on the strong presence of homosexual fiction in ancient, medieval and modern Indian fiction but they do not look closely at the present situation of non-heterosexual sexualities in India, like, Hijras, Kothis, Bisexuals and Gays.

Jenkins (2004) findKothis inside the culture, as lesser men the most stigmatized in the patriarchal, heterosexist and homophobic framework. They experience considerable violence and harassment and, unless protected by higher incomes and social status, often are unable to finish school or gain an occupation (Bondyopadhyay and Khan, 2002, 2004). Non-Kothi men having MSM (Men who have Sex with Men)

engagements with the Kothis report the denial of male-to-male sex and homophobia in stating that they just fool around when they have sex with Kothis, just discharging, not really having sex, like a “Real man” . Still considered males, but feeling gratified in the receptive role, these men are called Kothis, a term now widely used in India, Bangladesh and Pakistan and possibly related to the Thai term Katoey (Jenkins,2004). On the other hand, Reddy’s ethnographic fieldwork in Hyderabad found that Hyderabad Hijras fall under the umbrella term Kothis referring to a multitude of identities within the spectrum of male sexuality. Reddy examines the combination of the related male identities around the axis of the act of penetration during sexual intercourse, along with doing [gendered] work.

Reddy (2004) found two models of sexuality and gender in male same-sex behaviours: a “Gay” model and a “Kothi” model. National AIDS Control Organisation(NACO) has accepted the generic position of the Kothis, at least for the transformation to the Hijras. Compared to the academic positions, the activist Naz Foundation International(NFI), one of the largest non-profit organizations in South Asia working in the HIV/AIDS sector considers Kothi a sexual minority, a community historically rooted in Indian cultural traditions, as well as a self-identifying label, more a sexual signifier than a gender in a Kothi panthi dynamics. Their comprehension of “Kothi framework” (Khan,2000) is realistically complex, nuanced and politically empowering.

Khan (2005) also emphasizes the critical and urgent issues of behaviour versus identity debate of Kothi-Panthi binarity within broader context of MSM (Male Sex with Male) behaviour. The emphasize also include problems of proper counts of MSM behaviours and identities, risk, stigma and vulnerability to HIV/AIDS in the diverse social scenario of India. Recently Dey *et al.*, (2010) focused on the emergence of the construct of the new categories in West Bengal, similar to Reddy’s (2005) observation, within the network. The (sub) categories (like Arial Kothi, Koripese Kothi, Dupli Kothi, Dupli Gupti, Hijra, Parikh/Panthi/Giriya/Realman/Heterosexual and Homosexual, Gay and Bisexual) are situational usage, but indicate the expansion and intensification of the lived experiences. Perhaps, according to Dey *et al.*, (2010), they also indicate how the

cultural responses to identity and “otherness” culminate in forming and relating the local knowledge of gender, sexuality to the wider web of culture and society.

### **2.1.2 Research for transgender in general**

Rubin’s (1975) anthropological work on sex and gender of cultural and political analysis, Gagnon and Simon’s (1973) revolutionary studies, on transgendered prostitutes in Oman (Wikan, 1977) and later Vance’s (1991) anthropological reviews of the same may be associated with a series of similar anthropological confirmations of a wide diversity of same-sex issues. They also addressed sexuality and gender as the cultural phenomena, e.g. berdache or xaniths, female husbands, "boy inseminating rituals", “age-structured sexuality” or different other forms, Hijra.

Many research works thoroughly documented the presence of diverse expressions of same-sex sexuality in African traditional societies. Sociological research on transsexual studies on how the body is used in doing and attributing gender (Garfinkel, 1967; Kessler and McKenna, 1978; Bolin, 1988; Ekins, 1997) or managing stigma and passing (Kando, 1973; Feinbloom, 1976) or how the physical body is surgically altered (Raymond, 1979; Billings and Urban, 1982; Hausman, 1995) tell us about the relation of gender and sex and gender related social obstacles.

Research on sexuality touched India, principally as a by-product of HIV-AIDS activism. Gender, more than any other variable or a structural principle (Dowsett, 2003) dominates the pandemic of HIV/AIDS (Connell, 2002) which needs deeper structural analyses of gender (Liguori and Lamas, 2003) within and across the boundaries of cultures. The scholars (like Nanda, 1990; Morris, 1994; Cohen, 1995, 2005; Reddy, 2000, 2004, 2005, 2007; Hall, 2005; Khan, 2000, 2001, 2005; Purkayastha, 1999; and Jenkins, 2004) emphasize on the past and the present of the local categories of “other” genders and sexuality in India. The scholars differ and overlap in their frameworks in accepting any unanimous position. Nanda’s research works (1985, 1990, 1999) on the diversity of gender and sexuality, emphasized Hijras have other parallel works (Lynton and Rajan 1974; Vyas and Yogesh 1987; Sharma, 1989; Lal, 1997; Jaffrey, 1996; Reddy, 2005).

### **2.1.3 General characteristics**

A trans woman (sometimes trans-woman or transwoman) is a woman who was assigned male at birth who may experience Gender Dysphoria(GD). Symptoms of GD in children may include: disgust at their own genitalia, social isolation from their peers, anxiety, loneliness and depression. Adults with GD are at increased risk for stress, isolation, anxiety, depression, poor self-esteem and suicide (*Ansara et al.,2012*). According to the American Psychological Association, transgender children are more likely to experience harassment and violence in school, foster care, residential treatment centers, homeless centers and juvenile justice programs than other children (*Arlington, 2013*).

### **2.1.4 Education**

Conceptual review of studies reveals that the level of education was neither a criteria for joining Hijra community nor did they aspire for higher education. Several studies substantiate this argument. Studies conducted in Karnataka, Maharashtra, Delhi and Chennai show that the education level among hijras is very low (*Mahendraand Banerjee, 1970; Nerurkar and Banerjee,1971, NCTE,2015; Kosciw et al.,2011*) or they had no education at all (*Raymond and Banerjee, 1970*).

### **2.1.5 Occupation**

Traditional chores – Hijras are forced to live like destitute despite having their blood relatives alive. Distancing from family also triggers or contributes to several forms of ostracisation. Most of the hijras till date are into begging, commercial sex work or meager jobs (*Nanda, 2013*).

There are silver lines that few live like Priyanka, self-identified transsexual female who is working as Radio Jockey (RJ) (*Vikas, 2010; Moorthy, 2012*). Transgender person hosting a TV programme can become sensational news and one of the TV programme 1<sup>st</sup> of its kind in Tamil Nadu is anchored by Rose formerly known as Ramesh Venkatesan, who is a U.S.educated, former web site designer, with a Masters in biomedical engineering, who started wearing women's clothes full-time since 2004. Rose is one of the transsexual celebrity of Southern India and has been recognized as a

TV anchor and is still waiting for acceptance from her family and society at large (Gentelman,2008).

Female Actor – Laxmia Hijra the transsexual is one of the celebrities in India who participates in reality show and for TV documentaries. Revathi, a writer has also acted in a Tamil movie. Entrepreneurs – KalkiSubramanyam is an entrepreneur who encourages and involves herself with small scale handicraft business and also owns an interactive website (personal communication during Sexuality and Psychology conference on 29<sup>th</sup> and 30<sup>th</sup>January 2010 at the Department of Post Graduate Studies & Research in Psychology, SDM College, Ujire, Karnataka, India).

Beauty pageants – Famila participates in beauty pageants and has also starred in a movie portraying the life of Hijras (SeemanthiniandManjula, 2004; Manjula,2000). Another beauty contestant is Olga B. Arron (Amith, 2012). Anu a transsexual from Bangalore created history by becoming the 1<sup>st</sup> government servant. She has been appointed as assistant in high court of Karnataka (Naik, 2012).

Politics and Politician – ShabnamMausi is the foremost elected representative from Hijra community who became a successful politician in Uttar Pradesh and subsequently Ashadevi was selected to Vidhan Sabah from Gorakhpur (Laxmi,2011).ParveenBhanu one of the transgender who is popular in Bellary for her social work contested in the election during 2013 (Ahiraj, 2013). She is the first transgender woman to be a candidate from Congress party and is reported to be a people focused leader. She works for the downtrodden in her ward and works towards empowering the transgenders.

Literature – One area that transsexuals are emerging is being creative writers. Living smile Vidya who hails from Chennai pursued her interest in studies and went up to post graduation. She also published her autobiography in Tamil which was translated into Kannada in the year 2009. Revathia transgender activist and one of the most outspoken transgender have released her Autobiography. The Truth about me: A Hijra life story is one of the literature sources which vividly describe the life of a transgender who migrates from Chennai to Bangalore (Ramesh, 2010). She was recognized as an author along with the other writers during the Jaipur Literature Festival (Shrama, 2010).

### **2.1.6 Privilege in Tamil Nadu**

The transgender community considers Tamil Nadu to be one of the most progressive states in India. In the application form for both Identity cards and Ration cards an individual can enter M for Male, F for Female or T for Transgender or Third Gender. Tamil Nadu's stance on this issue is in stark contrast to that of its neighbor Kerala which is very progressive in many aspects but extremely homophobic and oppressive to transgenders as compared to the rest of the states in the country (The Hindu, 2013).

Hijra's in India – a news bulletin from Gita Pandey, BBC (2009) revealed that Eunuchs/transsexuals are given third gender option on India's election forms. Special news from BBC also reveals the prevalence rate of eunuchs to be about 5,00,000 in India. Hijra community comprises the hermaphrodite, transvestite and transsexual communities. Eunuchs are feared and reviled in many parts of India, where some believe that they have supernatural powers. In Delhi, the election commission's recognition of eunuchs as an independent group is a first step towards an official recognition of the community which has so far remained on the margins of society.

In 2010, Indian Express had reported that, the Punjab government has decided to create a separate category in application forms under which eunuchs can apply for government vacancies. Although there was no bar on eunuchs to apply for government jobs, this is the first time the state has given them an option to choose their identity apart from the men and women categories. Eunuchs aspiring for government jobs can now choose the new category — “transgender” — in application forms (Ohri, 2010).

In 2010 with the pseudonym Ramani a transgender represented the rest of sexual minorities in Karnataka requesting for provision to be made to utilize the swimming pools. The then Mayor responded by saying that he would see whether the provision could be considered (Ramani and Nataraj, 2010).

## **2.2 Health status of transgender**

### **2.2.1 Morbidity status**

There is higher incidence of cardio vascular disease, HIV, body image issues, food insecurity (Pamella, 2018) and syphilis (Tarynn, 2008), which suggest to develop a tool to assess and improve nutritional status and well-being (Pamella, 2018). Pisani *et al.*, 2014, Sahastrabuddhe *et al.*, 2012 and Prabawanti *et al.*, 2007 established the prevalence of HIV, syphilis and sexual risk behavior among transgender in which more than half of them were affected as a result of unprotected anal intercourse and there is a threat of wider epidemic. A research by Wilson 2007 showed that 75% of them are drug addict. Health and health care among transgender who are HIV positive faced greater difficulties in accessing health services than non-transgender (Rita *et al.*, 2006).

### **2.2.2 Deprived medical care**

Discrimination (NACP III, 2017-2012; Karen *et al.*, 2011; Grant *et al.*, 2011, LGBT health survey, 2010) in health care (Jamie *et al.*, 2011), verbal harassment (NCTE, 2015; Russell *et al.*, 2011; Kosciw *et al.*, 2011), social anxiety in gender role non-conformity, victimization and reduced social support (Karen *et al.*, 2011) lead to low self-esteem, stress (Russell *et al.*, 2011) and gender dysphoria (Murad *et al.*, 2010) which increased drug abuse (NTDS, 2010) and suicidality (Karen *et al.*, 2010). There is reduced usage of health care centers due to harassment both verbally and physically (NCTE, 2015; WPATH, 2001; Kosciw *et al.*, 2011), denied or delayed medical care (NCTE, 2015; Jason, 2012, Jamie *et al.*, 2011; NTDS, 2010; WPATH, 2001), blaming the transgender for their health status (WPATH, 2001) and poor economic conditions (Grant *et al.*, 2011; TLC, 2008). This resulted in poor health status, which needs an intervention (NAACP III, 2017-2012).

### **2.2.3 Mental health**

The violence faced by transgender reported high rate of violence and suggests opening a separate hostel for them (Veena, 2011). Vinay (2011) found out 90% depression prevalence rate among transgenders. High rent for houses and cheating after receiving advance is faced by more transgenders which affected their economy and state of living states, Sanika (2011). Quality of life (QOL) was tested for transgenders in which the overall QOL in terms of health was found to be good-

excellent (May,2011) and average well-being was also reported by Lakshmanan and Victor (2010).

#### **2.2.4 Physical health**

The physical fitness of transgender was noticed with lack of physical activity due to inadequate facilities, fear of harassment and lack of self-confidence, but on proper exercise, endorphin a stress relieving hormone is produced (Transnews,2010), replaced tear of muscles, loosened muscles in neck, face, shoulders, arms, hips; then to strengthen and stretch leg muscles and to make hips flexible (Kathleen, 2010) and for better transition in pre-hormone and pre-surgical therapy (Leland,2010).

### **2.3 Nutritional emphasis of transgender**

#### **2.3.1 Nutritional Assessment**

The nutritional assessment for transgender was carried out using anthropometric measurements, dietary survey(Veena,2011) and nutrition education was given(Padhmini,2017). The psychological state of the transgender was also considered.An initial study in 2010 by veena showed 2% were obese and more than half of the population to be malnourished. Sridevi and Veena (2011) has reported that emotional changes had a great impact on food choices and consumption. Hence, they lacked nutrients.A latest study in transgender has shown that 12% are underweight, 5% are ideal, 26% to be overweight and 19% to be obese(Padhmini,2017) and they mainly come under obese III grade for which immediate nutrition care, intervention(Whitney *et al.*,2018) strenuous physical activity andstrengthening physical activity (Vanikamet *al.*,2014) are to be given.An article by Anne danahy(2017) shows that transmen are more obese than transwomen.

#### **2.3.2Supplements during Hormone Replacement Therapy (HRT)**

Cameron(2013) on transgender nutritional considerations, states that many foods can assist male-to-female clients in fighting off increased levels of testosterone. Since males cannot produce estrogen in significant quantities, efforts to reduce levels of free

testosterone enhanced the impact of estrogen supplements taken during Hormone Replacement Therapy(HRT).

### **2.3.3Eating disorders**

The eating disorders present among the transgender was researched by an electronic search in which higher incidence rates(Jakub *et al.*,2017) of body fat dissatisfaction, increased body fat on assessment due to disordered food consumption(Smith,2011) was observed. Pills, laxatives consumption and vomiting were seen in higher rates among the transgender students (Elizabeth *et al.*,2015).

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## **CHAPTER III**

# **METHODOLOGY**

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### **III METHODOLOGY**

The methodology of the topic “**Micronutrient Status of the Selected Transgenders**” to find out the micronutrient status of the transgenders is discussed under the following headings:

- 3.1 Selection of the area
- 3.2 Selection of the sample
- 3.3 Identification of the transgender population
- 3.4 Formulation of data collection tool
- 3.5 Assessment of micronutrient status
- 3.6 Assessment of nutritional status and nutrition education
- 3.7 Post survey on the impact of nutrition knowledge
- 3.8 Data analysis

#### **3.1 Selection of the area**

The transgender people who live in Coimbatore and Tirupur were chosen to be the research participants.

Coimbatore and Tirupur city was selected for the study as the investigator is familiar with these places and the areas are easily accessible. The research participant from the specific places of Coimbatore and Tirupur was taken as it is the place where more number of transgender people live. Many transgender live in these places and were willing to give data to the investigator. These people had similar socio-economic status but had varied dietary pattern. The people in these places were co-operative and also encouraged others to participate in the study which was of great help for the successful completion of data collection by the investigator.

### **3.2 Selection of the sample**

A sample is “a smaller (representative/s) collection of units from a population used to determine truths about that population” (Field, 2005). Sampling methods are used to select a sample from within a general population. Proper sampling methods are important for eliminating bias in the selection process. They can also allow for the reduction of cost or effect in gathering samples (De Vos, 1998). Sampling seems to be a straightforward, but it isn't as straightforward as it initially seems, there is a set process to help researchers choose a simple sample (Brooke, 2014). Convenience sampling includes participants who are readily available and agree to participate in a study. Purposive sampling method focusses on a particular group of people. The sampling methods used in the present study are both convenience and purposive sampling methods. The samples selected for the study are the transgender belonging to the age group of 20-50 years. The transgenders are randomly selected from Coimbatore and Tirupur city. The investigator surveyed a total number of 147 samples from the above-mentioned area.

#### **Inclusion criteria**

- Transgender from Coimbatore and Tirupur city
- Co-operative for the study
- Willing to give written consent
- Healthy individuals without any illness/ disease in an individual

#### **Exclusion criteria**

- Male and female from Coimbatore and Tirupur
- Non-co-operative for the study
- Not willing to give written consent
- With illness/ disease in an individual

### **3.3 Identification of the transgender population**

The step prior to preparation of tool (questionnaire) to conduct the study, after selecting the target group was the search for permission granting authority. The investigator approached many centers where transgender population was available. After several visits and search for centres, the NGO Namdhesam Foundation granted permission for the conduct of the study.

Namdhesam Foundation is a non-profitable organization registered under Indian Trust Act, 2015. This is a charitable foundation which funds for the physically challenged people's medical needs and education. They are in tie up with Nirangal organization which works for the empowerment of transgender people which has its team members all over Tamil Nadu.

The NGO provided more convenience and allowed the investigator to independently carry out data collection. From 50 dates given by the NGO to meet the members, the investigator chose 30 convenient dates on which the team members could accompany. On these specified dates, the team member accompanied the investigator and introduced to the head of the transgender people. The head was explained about the study made by the investigator. The head felt happy and readily accepted to participate in the study. She also encouraged their community members to participate in the study. Data collection was facilitated as the participants convinced others also to participate in the study. Written signed consent in Tamil was obtained from the participants who were willing to be the active participants of the study (Appendix IV).

### **3.4 Formulation of data collection tool**

A questionnaire is a data collection instrument consisting of a series of questions and other prompts for the purpose of gathering information from respondents. A

questionnaire was specially designed to elicit information on the socio-economic background, food habits, food pattern, food frequency pattern, morbidity and exercise pattern, clinical examination, vitamin-mineral analysis and assessing the knowledge about nutrition among the transgenders along with the general information about each individual. The questionnaire was pre-tested on a sample population before the conduct of the survey.

The tool used for the study was a written questionnaire with closed ended questions. The questionnaire was designed in such a manner that none of the questions were difficult for the research participants to answer. The points which the investigator wished to focus was included in the questionnaire for better analysis and interpretation. These questions were enquired in such a way that the research participants felt comfortable to answer and a comfort zone was also provided for them.

The questionnaire comprised of general information in which the personal details including name, date of birth, age, educational qualification, phone number, type of transgender and the transition age of the individual could be collected. Occupation, monthly income, religion and community related questions were grouped under socio-economic status.

Under food habits and food pattern, type of meal and snack intake, food preference and choices, skipping of meals, drug intake, food allergy and food frequency and other related questions was included.

For nutritional assessment height, weight, BMI, waist circumference, hip circumference, waist-hip ratio and 3-day dietary recall was collected and recorded. Morbidity pattern of the individuals was found using the recall of illness for past 6 months in which duration and mode of treatment was also noted.

Exercise pattern followed by the participants are collected using questions like practising exercise like jogging, walking, aerobics, yoga and meditation with the duration of that practice was asked to check their physical fitness.

For assessing the micronutrient status, clinical examination by standard signs and symptoms caused due to deficiencies was used and vitamin-mineral levels checked using vitastiq.

To assess their nutritional knowledge, enquiry on their opinion about nutrition, junk food, dieting, soft drinks, opting nutritious foods for healthy life, nutraceutical property of foods, essentials of vitamin-mineral, importance of drinking adequate water and their knowledge about Basic V food groups, energy giving and body building foods was done.

And other details like support from government and NGO to the transgender, details on sex replacement surgery, awareness on voice training was also included. Feeling of stress, recreational activities, addiction to mobile phone, special talent and aimed profession was also detailed.

To know about their interest in nutrition, queries on nutrition and acknowledgement for mistakenly hurting was also mentioned in the questionnaire.

Pilot-testing was made immediately after framing the questionnaire with 1/10<sup>th</sup> of the research participants and suggestions expressed by them were made, as some questions seemed to be a bit difficult for them to answer. Appropriate changes was made to make these questions easily answerable and was successful. Initially the investigator made two visits to interact with the participants and to set familiarity and to create a friendly relationship among the participants. The data was collected in two sessions which made the research participants to open up to the investigator. Data collection was done for approximately 100 days and was recorded for study purpose (Appendix I).

### **3.5 Assessment of micronutrient status**

Vitamin and mineral status in our body can be obtained in several ways. The most common and well acceptable way is to assess vitamin and mineral concentration from blood serum or plasma. Results obtained by these well-established analytical methods require professional explanation. An alternative to blood testing is Electro-Acupuncture method according to Voll (EAV). EAV has been used for decades in

pharmacies and by specialists. It is based on the acupuncture energy meridians theory and Reinhold Voll's electro-acupuncture research (SnežanaKocijančič,2017). The device selected for the conduct of the study was Vitastiq Family. This device is easy-to-use, non-invasive and convenient. This can be used by connecting the device by Bluetooth withthe android mobiles. This device was chosen as it would avoid ethical blood sampling bias. The device was procured from Dr.Store which is a second dealer of the brand which is in Mumbai and assured safe delivery of the device. The device was initially tested for its working and then used for the study.

To use the vitastiq, the app was downloaded using google play store. Then the registered e-mail id is to be logged in. A profile is to be created with a preferred template. The template consists of the selection of vitamin and minerals to be assessed. Then to start with the measurement,bluetooth and location of the device is to be turned on. The start button is to be clicked from which the device gets connected to the mobile by bluetooth. The machine is in ready state to take measurements. Instructions for each referral points are given in the app. On following the instruction, the person handling the device should place the device in the specified referral point of the person on whom it is to be tested. Indications like low, mild, normal and high indicates the level of the specific vitamin/ mineral present in the body. On completion of measuring all the readings the final report of the subject will be displayed. Then on choosing the overview option, the deficiency symptoms and advice appears. Home option in the device helps to get ready for next calibration. Approximately the complete time taken for calibration by the device is 7-10 minutes, which depends upon the participant's co-operation. The advantage of the device is that there is provision for measuring vitamin-mineral status of many number of persons, easy-to use, non-invasive, occupies less space, handy and portable.Measuring micronutrient status using vitastiq of the participant is shown in Plate1.

### **3.6 Assessment of nutritional status and nutrition education**

The condition of health of a person is influenced by the balance in food intake and normal utilization of nutrients by the human body is called nutritional status. Nutritional assessment is the process whereby the state of nutritional health of an

individual or group of individuals is determined. The nutritional status of the selected transgender was assessed, through anthropometric measurements. There are a few simple ways by which the nutritional status can be known and is by measuring physical growth; by determining dietary intake, by recognizing nutritional deficiency diseases (Bosh,2013).

Nutritional status is the current body status of a person or a population group, related to their state of nourishment (the consumption and utilization of nutrients). The nutritional status is determined by a complex interaction between internal/constitutional factors and external environmental factors: internal or constitutional factors are: age, sex, nutrition, behavior, physical activity and diseases. External environmental factors include: food safety, cultural, social and economic circumstances. An ideal nutritional status occurs when the supply of nutrients conforms to the nutritional requirements or needs (Kosch, 2011).

### **Methods of nutritional assessment**

Nutrition is assessed by two methods; direct and indirect. The direct method deals with the individual and measure objective criteria, while indirect method use community indices that reflect the community nutritional status/needs (Open University, 2019)

#### **3.6.1 Anthropometric measurements**

Anthropometry is the measurement of the human body. Anthropometric measures are used to assess the nutritional status of an individual and population groups, and as eligibility criteria for nutrition support programmes. Common anthropometric measures are height, weight and mid-upper arm circumference (MUAC).

The pattern of growth and the physical state of the body though genetically determined is profoundly influenced by diet and nutrition. Anthropometry is being used as an important criterion as it is concerned with the measurement of the physical dimension and the gross composition of human body at different age groups (NNRP,2016).

### 3.6.1.1 Weight

Body weight is the most widely used and simplest reproducible anthropometric measurement for evaluation of nutritional status of the children. A portable electronic weighing balance was used to determine the weight of the participants. The balance was set to zero and the participants were made to stand erect on the machine without foot wear and with light clothing. The weight was recorded to the nearest gram; the weight was taken thrice in order to avoid errors. This was used to calculate BMI of the individual (ICMR,2016). Measuring the weight of the participants is shown in Plate 2.

### 3.6.1.2 Height

The height of an individual is influenced both by genetic and environmental factors. The height of the selected participants was measured using a vertical anthropometer, the participant was made to stand erect looking straight on a levelled surface with heels together and toes apart, without footwear. The moving head piece of the anthropometer was lowered to rest flat on the top of the head and reading was taken thrice. This was used to calculate BMI of the individual(ICMR,2016). Measuring the weight of the participants is shown in Plate 3.

### 3.6.1.3 Body Mass Index (BMI)

Body Mass Index (BMI)measures the weight status of the body in relation to the fat. It is a simple tool that helps to figure out the amount of excess body fat and the associated risks of carrying this extra weight.

$$\text{BMI} = \frac{\text{Weight (Kg)}}{\text{Height (m}^2\text{)}}$$

**TABLE I**

**Nutritional status based on WHO and Asian criteria values**

<b>Nutritional Status</b>	<b>WHO Criteria BMI cut-off</b>	<b>ASIAN Criteria BMI cut-off</b>
Underweight	<18.5	<18.5

Normal	18.5-24.9	18.5-22.9
Over weight	25-29.9	23-24.9
Pre-obese	-	25-29.9
Obese	≥30	≥30
Obese Type I (obese)	30-40	30-40
Obese Type II (morbid obese)	40.1-50	40.1-50
Obese Type III (super obese)	>50	>50

**\*WHO 2017**

### **3.6.1.4 Waist circumference**

The WHO STEP wise approach to Surveillance (STEPS) provides a simple standardised method for collecting, analysing and disseminating data in WHO member countries. The WHO STPES protocol for measuring waist circumference instructs that the measurement be made at the approximate midpoint between the lower margin of the last palpable rib and the top of the iliac crest (WHO, 2008)

The United States (US) National Institutes of Health (NIH) protocol provided in the NIH Practical guide to Obesity (NHLBI Obesity Education Initiative,2000) and the protocol used in the US National Health and Nutritional Examination Survey (NHANES)(Westat Inc,1998) indicate that the waist circumference measurement should be made at the top of the iliac crest.

The NIH also provided protocol for the measurement of the waist circumference for the Multi Ethnic Study of Atherosclerosis (MESA) study. This protocol indicates that the waist measurement should have made at the level of the umbilicus or navel. However, published reports indicate that measurements of waist circumference made at the level of the umbilicus may underestimate the true waist circumference (Croft *et al.*, 1995)

Some studies have assessed the waist circumference at the point of the minimal waist(Ross *et al.*,2008). Measuring the weight of the participants is shown in Plate 4.

### **3.6.1.5 Hip circumference**

All the protocols mentioned in waist circumference, indicate that the hip circumference measurement should be taken around the widest portion of the buttocks. Measuring the weight of the participants is shown in Plate 5.

### **3.6.1.6 Waist-Hip Ratio (WHR)**

The waist-hip ratio or waist-to-hip ratio (WHR) is the dimensionless ratio of the circumference of the waist to that of the hips. This is calculated as waist measurement divided by hip measurement ( $W \div H$ ).

$$\text{Waist-Hip Ratio} = \frac{\text{Waist circumference}}{\text{Hip circumference}}$$

The WHR has been used as an indicator or measure of health, and the risk of developing serious health conditions. The values corresponding for female 0.85 and male 0.90 shows obesity, on exceeding these value (WHO,2011)

### **3.6.2 Clinical examination**

Physical signs and symptoms of malnutrition act as valuable aids in detecting nutritional deficiencies. These may include delayed growth and development as determined by comparing an individual or a group with normal values on growth charts; pallor of the skin, mucous membranes of the mouth and eyes, nail beds or palm surfaces and more serious signs of advanced protein-calorie malnutrition such as changes occurring in hair colour and body appearance, as by edema. Obviously, the sooner clinical public health intervention programs can be formulated (NCBI, 1973). The tabulation below explains the signs caused in particular sites on the event of deficiencies. The signs and symptoms experienced by the study participants are examined with the help of a clinical physician.

**TABLE II**  
**Clinical Examination**

<b>Sites</b>	<b>Sign</b>	<b>Deficiency</b>
Hair	Easily plucked	Protein
	Alopecia	Protein
	Dry, brittle hair	Protein, biotin
	Corkscrew hair	Vitamin C
Nails	Spooning	Iron
	Transverse lines	Protein
Skin	Dry and scaly flaky paint	Vitamin A, zinc
	Nasolabial seborrhea	Essential fatty acid, riboflavin, pyridoxine
	Psoriasis form rash	Vitamin A, zinc
	Pallor	Iron, Vitamin B12, folate
	Follicular hyperkeratosis	Vitamin A, Essential fatty acid
	Perifollicular hemorrhage	Vitamin C
	Easy bruising	Vitamin C, K
Eyes	Night blindness	Vitamin A, zinc
	Photophobia	Vitamin A, zinc
	Xerosis	Vitamin A, zinc
	Conjunctival inflammation	Riboflavin, vitamin A
	Retinal field defect	Vitamin E
Mouth	Glossitis	Riboflavin, pyridoxine, niacin, folic acid, vitamin B12, iron
	Bleeding gums	Vitamin C, riboflavin
	Angular stomatitis	Riboflavin, pyridoxine, niacin
	Cheilosis	Riboflavin, pyridoxine, niacin
	Decreased taste or smell	Zinc
	Tongue fissuring	Niacin
	Tongue atrophy	Riboflavin, niacin, iron
	Loss of tooth enamel	Calcium
Neck	Goiter	Iodine
	Parotid enlargement	Protein
Extremities	Edema	Protein, thiamine
	Atoxia	Vitamin B12
	Bone/joint pain	Vitamin A or C
	Muscle pain	Thiamine
	Hyporeflexia	Thiamine
	Weakness	Protein, calorie, vitamin D, selenium, sodium chloride
Thorax	Thoracic rosary	Vitamin D

\* Sri Lakshmi 2017, Nutrition Science

### **3.6.3 Dietary assessment - 3 day recall method**

This is a method in which the food intake of an individual is noted for a minimum period of three days. For three consecutive days the food consumed and beverage consumed is noted even for the non-working days. The food is weighed using standard measuring scales and utensils. This helps to determine the food intake and nutrient intake of an individual. Analysis was done by comparing the food intake with Basic V food groups of Indian standards as particular RDA is not available for Transgenders.

### **Nutrition education**

Nutrition education can be defined as any set of learning experiences designed to facilitate the voluntary adoption of eating and other nutrition-related behaviors conducive to health and well-being. It is an integral part of providing nutrition services to older persons (DSHS, 2013).

The nutrition education was given in the form of a power point presentation in which the slides contained information regarding the definition of nutrition, its importance, Basic V food groups, macro and micro nutrients with suitable examples; importance of fibre, water and seasonal foods. The need for physical activity, yoga and medication for health was flashed on. The participants cleared their doubts from the investigator.

The investigator also educated the participants about their deficiencies which was found by clinical examination and by using Vitastiq, the participants was informed about the deficiency cause, immediate measures for the deficit ones. Preventive measures were also suggested for near deficiency susceptible nutrients.

The nutrition education was given fortnightly in four sessions using a Power Point presentation (Appendix II). This gave the participants a basic view about nutrition and healthy lifestyle. This was followed by a post survey after duration of one month.

### **3.7 Post survey on the impact of nutrition knowledge**

The nutrition knowledge imbibed by the participants given through nutrition education was assessed after a period of one month.

The participants were re-assessed for their nutritional knowledge about their opinion about nutrition, habit of junking, dieting, soft drinks consumption, role of nutritious foods for disease-free life, medicinal property of foods, essentials of vitamin-mineral, importance of drinking water and their knowledge about Basic V food groups.

Questions also included on their personal experience about learning nutrition and applying it in their daily routine.

Score was given for the quality of material, content, understandability, applicability, presentation by the investigator and a suggestion column was also given.

The level of their micronutrient status was again tested after nutrition education after a period of one month.

### **3.8 Data analysis**

The collected data were tabulated, analyzed and comparison was made with the standard values. Interpretations were made based on the global nutritional assessment classification.

The data collected among the 147 research participants was consolidated using SPSS software and the mean, standard deviation and correlation were determined. Those which required special note were represented in graphical- pictorial representation.

The data collected was interpreted with Indian standards for BMI and Basic V food groups for dietary survey.

Taking into consideration the socio-economic status, activity, dietary habits, food allergies, physical health, micronutrient intake and micronutrient assessment the investigator concluded the study.

The study was presented before the Institutional Human Ethics Committee for approval. The approval number of the present study is AUW/IHEC-18-19/FSN/FHP-01.

The research design of the study is presented in Figure I.



**PLATE 1**

**Measuring Micronutrient Status using Vitastiq**



**PLATE 2**

**Measurement of Weight**



**PLATE 3**

**Measurement of Height**



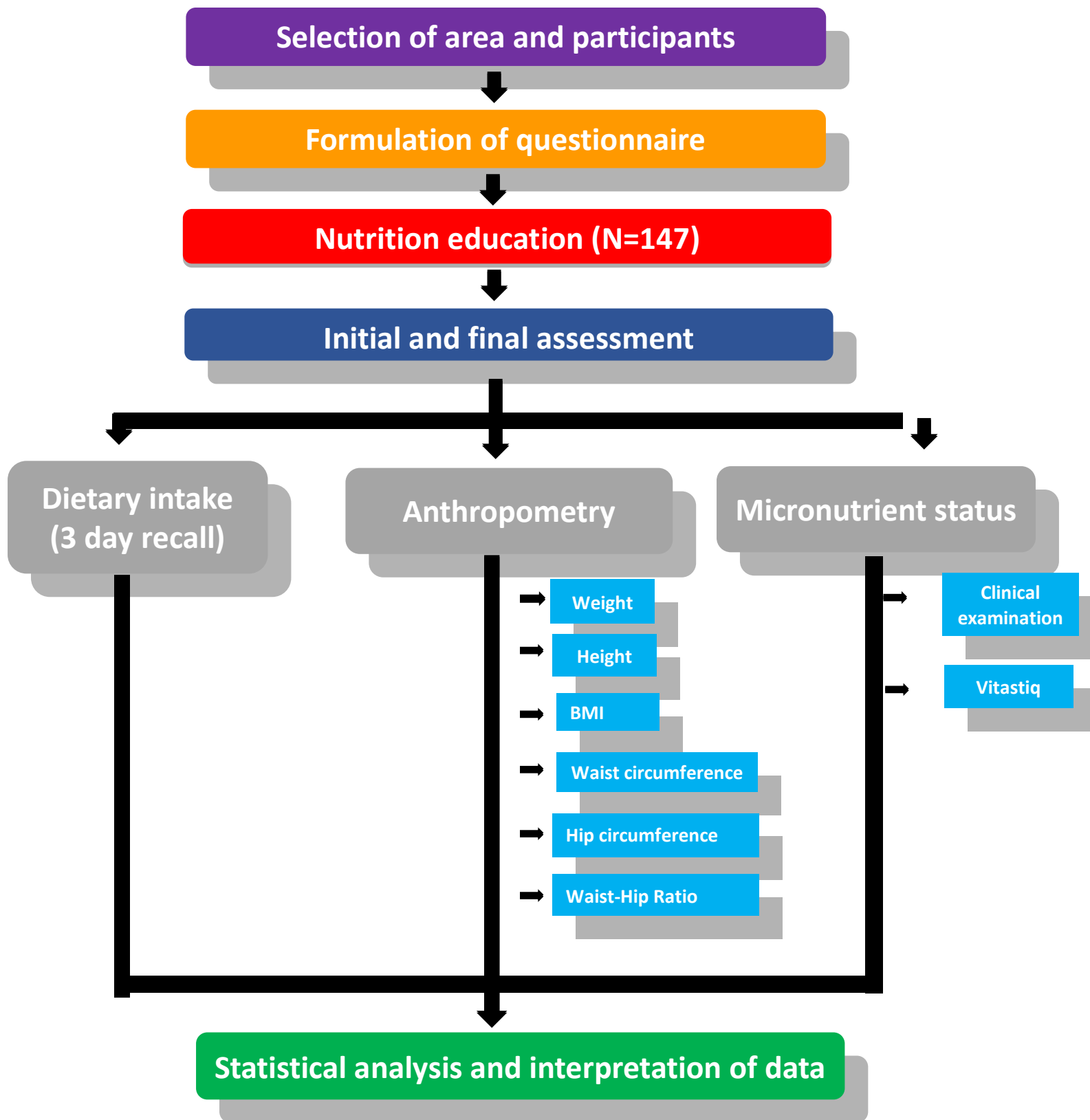
**PLATE 4**

**Measurement of Waist Circumference**



**PLATE 5**

**Measurement of Hip Circumference**



**Figure I**

**Research Design**

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**CHAPTER IV**  
**RESULTS AND DISCUSSION**

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## IV RESULTS AND DISCUSSION

The Results and Discussion pertaining to the study titled “**Micronutrient Status of the Selected Transgenders**” is discussed under the following heads:

- J. Socio economic status of the transgender
- K. Dietary pattern of the transgender
- L. Nutritional status of the transgender
- M. Morbidity pattern of the transgender
- N. Lifestyle pattern of the transgender
- O. Nutritional awareness among the transgender
- P. Other details
- Q. Vitamin-mineral assessment before and after nutrition education
- R. Association between Food Allergy and Nutrients

### A. Socio economic status of the transgender

#### Personal Details of the transgender

Table III gives the personal details of the transgender.

**TABLE III**  
**Personal Details of the Transgender**

Variables		Total	
		No	%
Age (in years)	Below 20	31	21.1
	21-30	100	68.1
	31-40	9	6.1
	Above 41	7	4.7
<b>Total</b>		<b>147</b>	<b>100</b>
Religion	Hindu	131	89.1
	Muslim	6	4.1
	Christian	10	6.8
<b>Total</b>		<b>147</b>	<b>100</b>
Community	OC	5	3.5
	BC	117	79.5
	MBC	13	8.8
	SC	5	3.5
	ST	7	4.7
<b>Total</b>		<b>147</b>	<b>100</b>

Age is a factor which progresses from the birth of a child and plays a major role in the nutrient requirement. The transgender of the study was grouped based on their age to note it for nutritional consideration. In the study, majority (100 transgender with 68.1 %) of the subjects was in the age group of 20-30 years and 31 (21.1 %) of them was below 20 years of age. The minority age seen was between 20-30 years and 30-40 years with 9 (6.1 %) and 7 (4.7 %) transgender respectively. It was astonishing to hear that there was none of the transgender who survived above the age of 60 years and was mainly due to decreased health care centers for the transgender.

In the democratic country like India, each person is free to choose their religion. Religion gives an individual a belief to move on with. The study participants were mainly interested in Hinduism, Christianity and Muslim religion. There was no evidence for other religions to be followed. Hinduism religion was followed by 131 (89.1 %) of the transgender followed by Christianity and Muslims by 10 (6.8 %) and 6 (4.1 %) transgender respectively.

People was grouped using castes to recognize the work they do, to make the ruler convenient to offer scheme to people with low income but nowadays the term has transformed to be something which destroys the integrity of the nation. On studying the transgender, they were reluctant to mention their caste and were proud to be grouped as transgender only but mentioned their caste just for data. 117 (79.5 %) transgender belonged to backward caste and others namely most backward caste, scheduled tribes, scheduled caste and other caste was with 13 (8.8 %), 7 (4.7 %), 5 (3.5 %) and 5 (3.5 %) transgender respectively.

### **Educational and Economic Status of the Transgender**

The educational and economic status of the transgender is given in Table IV.

**TABLEIV**

**Educational and Economic Status of the Transgender**

<b>Variables</b>		<b>Total</b>	
		<b>No</b>	<b>%</b>
Educational status	Secondary (VI-X)	97	65.9
	Higher secondary (XI, XII)	34	23.3
	Under Graduate	10	6.8
	Post Graduate	4	2.7
	Technical education	2	1.3
<b>Total</b>		<b>147</b>	<b>100</b>
Occupation	Accountant	1	0.7
	Collection of money from public	104	70.7
	Dancer	15	10.2
	Caterer	13	8.8
	Radio jockey	1	0.7
	Auto driver	1	0.7
	Non-earning members	12	8.2
<b>Total</b>		<b>147</b>	<b>100</b>
Monthly income (Rs)	4500-7500	25	17.1
	7500-15,000	101	68.7
	>15,000	21	14.2
<b>Total</b>		<b>147</b>	<b>100</b>

Education is the prime most right of any gender in the world, which is common to all. Denying education based on their gender is inequal. It is happy to note that all the transgender has completed at least their primary education and markedly 2 (1.3 %) members have done their technical education. On the other hand, none of them had graduated in professional education. 97 (65.9 %) of the transgender have completed

their secondary education, 34 (23.3 %) have completed higher secondary education, 10 (6.8 %) have completed their under graduate whereas 4 (2.7 %) and 2 (1.3 %) of them have finished their post-graduation and technical education. They should be encouraged to study the course they wish irrespective of their gender.

Generally people think occupation is chosen to earn money but choosing a profession with passion gives a person a good income and satisfaction. But in the case of transgender their ambition, goals and right to choose the desired profession is actually denied earlier. This case has changed recently by allocating seats for transgender in nearly all government sectors; they are welcomed to serve for the nation. But the awareness is less and due to low educational qualification they choose their occupation as follows. The occupation of the transgender was collecting money (104 transgender with 70.7 %) from the general public, dancing (15 transgender with 10.2%), catering (13 transgender with 8.8 %), non-earning (12 transgender with 8.2 %), accountant (1 transgender with 0.7 %), radio jockey (1 transgender with 0.7 %) and auto driver (1 transgender with 0.7 %).

Based on the occupation chosen they earned an average of Rs. 7,500/- to 15,000/- (101 transgender with 68.7 %), Rs. 4,500/- to 7,500/- (25 transgender with 17.1 %) and above Rs.15,000/- (21 transgender with 14.2 %). The economic status of transgender could be improved by accepting them and giving them jobs in the companies and in government sectors.

## Type of Transgender

The type of transgender of the study is explained in Table V.

**TABLE V**

### Type of Transgender

Type of transgender	No	%
Female to Male (FTM)	-	-
Male to Female (MTF)	147	100
Cross-dresser	-	-
Drag queen	-	-
Drag king	-	-
Gender queer	-	-
<b>Total</b>	<b>147</b>	<b>100</b>

There are various types of transgender in the world like MTF, FTM, cross dresser, drag queen, drag king and gender queer. In India, the most predominant type of transgender was MTF. The study aimed at finding different types of transgender but all the transgender obtained were Male to Female transgender. No one from the other categories like FTM, cross dresser, drag queen, drag king and gender queer were identified or located by the researcher.

## B. Dietary pattern of the transgender

### Dietary Pattern of the Transgender

The dietary pattern of the transgender is given in Table VI.

**TABLEVI**

**Dietary Pattern of the Transgender**

<b>Variables</b>		<b>Total</b>	
		<b>No</b>	<b>%</b>
No of meal/s and snack/s	2+2	95	64.6
	3+2	35	23.8
	4+2	5	3.4
	Other	12	8.2
<b>Total</b>		<b>147</b>	<b>100</b>
Skipping meals*	Breakfast	23	
	Lunch	14	
	Dinner	2	
<b>Total</b>		<b>39</b>	
Consumption of beverages*	Milk	64	
	Coffee	23	
	Tea	18	
	Others	-	
<b>Total</b>		<b>105</b>	

**\*Multiple response**

Food is the first necessity of life. Following a good dietary pattern is very important for a healthy and disease-free lifestyle. To study the healthiness of the transgender the dietary pattern was studied. The dietary pattern as revealed by the transgender was 2+2 meals and snacks per day by 95 (64.6 %) transgender, 3+2 meals and snacks per day by 35 (23.8 %) transgender, other meal pattern by 12 (8.2 %) transgender and 4+2 meals and snacks per day by 5 (3.4 %) transgender. Skipping meals also play an important role in making an individual unhealthy. Skipping of meals was seen among 39 participants in which 23 transgender skipped their breakfast, 14 transgenderskipped lunch and 2 transgender skipped their dinner. Investigating the consumption of beverage will help to make note of the milk consumption of the individual. More than half the transgender interviewed consumed beverages like milk by 64 transgender, coffee by 23 transgender and tea by 18 transgender.

**Habit of Chewing and Smoking**

Details regarding the habit of chewing and smoking is explained in the Table VII.

**TABLEVII**

**Habit of Chewing and Smoking**

<b>Type of drug *</b>	<b>No</b>
Drinks	21
Tobacco	5
Smoking	63
Cool lip	24
<b>Total</b>	<b>113</b>

**\*Multiple response**

The habit of chewing and smoking will impair nutritional status of an individual. Hence details on the usage of drugs was collected among the transgender. Many transgender was feeling that usage of drugs is harmful and unethical and did not consume any drugs. But some of them were addicted and some enjoyed using it occasionally. On collecting information, it was noted that the transgender have the habit of smoking (63 transgender) predominantly. The habit of drinking (21 transgender), cool lip (24 transgender) and tobacco (5 transgender) intake was also seen among the transgender. This was used by them for mind relaxing, to have fun and on special occasions.

**Catering Habits of Transgender**

Table VIII shows the outside catering habits of the transgender.

**TABLEVIII**

**Outside Catering Habits of the Transgender**

<b>Variables</b>		<b>Total</b>
		<b>No</b>
Place of eating	Home & Hotels	147
<b>Total</b>		<b>147</b>
Frequency*	Daily	-
	Weekly	113

	Monthly	21
	Occasionally	13
<b>Total</b>		<b>147</b>
Type of food consumed outside*	Fried foods	116
	Savouries/sweets	124
	Steamed foods	12
	Juices / Soups	98
	Milkshake / Ice-cream	25
	Pizza/ Burger	6
	Soft drinks	119
	Chat items	14
	Others	65
<b>Total</b>		<b>579</b>

**\*Multiple response**

The outside catering habits of the transgender was assessed and it was found that all of them ate food in home and hotels as most of them earn their living by collecting money from the public and hence they are out of their houses which make them eat cheap roadside foods. With a frequency of weekly once (113 transgender), monthly once (21 transgender) and occasionally (13 transgender) transgender had food. Due to low purchase parity power they tend to go in for locally available unhealthy foods. The food preferred by most of the transgender was savouries/sweets (124 transgender), soft drinks (119 transgender) and deep-fried foods (116 transgender), followed by juices / soups (98 transgender), other foods (65 transgender), milkshake/ ice-cream (25 transgender), chat items (14 transgender) and pizza / burger (6 transgender).

**Food Allergies**

The details regarding the food allergies experienced by the transgender is depicted in Table IX.

**TABLE IX**  
**Details of Food Allergies**

<b>Type of foods*</b>	<b>Name of the food</b>	<b>No</b>
Hot foods	Mango, papaya, egg, pineapple, jackfruit, mutton	12
	Chicken, crab	23
Cold foods	Buttermilk, lemon juice	54
Gas producing	Cabbage, potato, plantain	14
Bile producing	Tea, coffee, groundnut	2
Skin allergy	Sheep	5
	Brinjal, yam, tapioca	9
Constipation	Low water consumption	4
Others	Application of oil	9
	Fish, jack fruit	18
	Tomato	8
<b>Total</b>		<b>158</b>

**\*Multiple response**

Food allergy is common for all individuals. The food we take may not suit the same way for everyone. Knowing the food allergy of an individual is very important to improve the nutritional status of an individual. Henceforth the food allergy of the transgender was made a note. Most of the food allergy as expressed by transgender was due to the consumption of buttermilk and lemon juice (54 transgender), followed by the consumption of chicken and crab (23 transgender) and fish and jackfruit (18 transgender). Then cabbage, potato, plantain was allergy to 14 transgender. Mango, papaya, egg, pineapple, jackfruit, mutton was allergy to 12 transgender, Brinjal, yam, tapioca, application of oil by 9 transgender, tomato by 8 transgender, sheep by 5 transgender and tea, coffee, groundnut by 2 transgender. These allergies were caused only on intake of these foods which caused stomach upset, vomiting, cold, fever, lesions on surface of the skin, increased bile secretion, unwanted gas formation, constipation, rashes, heat boils and various other symptoms. This was not noticed when these foods

was excluded. But exclusion of certain foods may increase the incidence of nutrition deficiencies. Hence proper supplementation or alternative food source is to be taken to maintain good health.

### Food Frequency of the Transgender

Food frequency of the transgender is explained in the Table X

**TABLE X**  
**Food Frequency of the Transgender**

Food groups*	Daily	Weekly twice	3-5 times in a week	Weekly once	Fortnightly	Occasionally	Never
Cereals	147	-	-	-	-	-	-
Pulses	147	-	-	-	-	-	-
Green leafy vegetables	-	65	-	71	-	7	4
Other vegetables	147	-	-	-	-	-	-
Roots and tubers	-	32	-	73	-	39	3
Fruits	-	45	21	73	-	6	4
Milk and milk products	72	-	20	-	-	-	-
Flesh foods	26	71	-	35	-	15	-
Sugar and jaggery	147	-	-	-	-	-	-
Oil, Butter and ghee	147	-	-	-	-	-	-
<b>Total</b>	<b>833</b>	<b>213</b>	<b>41</b>	<b>252</b>	<b>-</b>	<b>67</b>	<b>11</b>

\*Multiple response

Food is the integral part of our living which will make us convenient to analyze the nutritional status of the individual. Therefore, the food frequency of each food group was noted. It was evident that consumption of fruits, vegetables, milk was minimum in daily consumption and was consumed either once or twice in a week. This was consumed in reduced amount because procurement and usage of these foods

was costly and cooking time was more. The food frequency of the transgender reveals that cereals, pulses, other vegetables, sugar and oils was used daily by all the transgender. Green leafy vegetables are consumed once a week (71), weekly twice (65), occasionally (7) and never consumed by 4 transgender. Roots and tubers are consumed weekly once by 73 members, occasionally by 39 members, weekly twice by 32 members and never consumed by 3 members. Fruits are consumed weekly once (45) or twice (73), weekly 3 -5 times (21), occasionally (6) and never consumed (4). Milk and its products are consumed mostly daily (72) and weekly 3-5 times (20). Flesh foods are consumed once a week (71), weekly once (35), daily (26) and occasionally (15). The food frequency could be improved by teaching to choose low cost foods and type of best cooking method to retain nutrients which would be convenient and less time consuming.

### **Consumption Frequency of Micronutrient Rich Foods of the Transgender**

The details regarding the consumption frequency of micronutrient rich foods frequency of the transgender is depicted in Table XI.

**TABLE XI**  
**Consumption Frequency of Micronutrient Rich Foods of the Transgender**

<b>Micronutrient Rich foods*</b>	<b>Daily</b>	<b>Weekly</b>	<b>Fortnightly</b>	<b>Monthly</b>
Vitamin A	21	140	23	-
Vitamin B	76	25	12	-
Vitamin C	113	65	58	12
Vitamin D	121	26	41	12
Vitamin E	123	25	58	16
Calcium	72	20	13	15
Magnesium	147	25	25	7
Phosphorus	-	25	12	-
Potassium	147	65	19	28
Sodium	140	29	18	9
Trace minerals	141	26	18	9
<b>Total</b>	<b>1101</b>	<b>471</b>	<b>297</b>	<b>108</b>

### \*Multiple response

The micronutrient rich foods was listed out in the questionnaire and the food frequency of micronutrient rich foods was calculated by enquiring the transgender about their food frequency towards micronutrient rich foods and was noted. This will also be helpful to assess their micronutrient status which was the main aim of the study. Magnesium and phosphorus is consumed daily by all the transgender. Trace minerals rich foods like liver, poultry, fish, whole grains, soy bean, brown rice, corn oil and pine apple was consumed by 141 transgender. Sodium (140), vitamin E (123), vitamin D (121), vitamin C (113), vitamin B (76), calcium (72) and vitamin A (21) rich foods also was consumed by transgender. The weekly consumption of vitamin A was by 140 transgender, vitamin C, potassium by 65, sodium by 29, trace minerals by 26, vitamin B, vitamin E, magnesium, phosphorus by 25 and calcium by 20 transgender. Monthly consumption of potassium was by 28 transgender, vitamin E by 16, calcium by 15, vitamin C, vitamin D by 12, sodium, trace minerals by 9 and magnesium by 7. Fortnightly consumption of vitamin E, vitamin C by 58, vitamin D by 41, magnesium by 25, vitamin A by 23, potassium by 19, sodium, trace minerals by 18, calcium by 13, vitamin B and potassium by 12 transgender.

## C. Nutritional status of the transgender

### Diet Pattern of the Transgender

The diet pattern of the transgender is shown in Table XII.

**TABLE XII**

**Diet Pattern of the Transgender**

<b>Diet</b>	<b>No</b>	<b>%</b>
Balanced diet	147	100
Unbalanced diet	-	-
<b>Total</b>	<b>147</b>	<b>100</b>

A balanced diet comprises the Basic V food groups in the meals in the right proportion as depicted in my plate model. But for the present study a meal was considered to be a balanced diet if and at least three food groups was present. All the transgender consumed a balanced diet when compared with the Basic V food groups.

## Nutrient Intake

The nutrient intake of the transgenderis shown in Table XIII.

**TABLEXIII**  
**Nutrient Intake of the Transgender**

Nutrients	Mean nutrient intake		Excess or deficit
	Mean $\pm$ SD	RDA	
Energy (Kcal)	1979.5 $\pm$ 773.3	2727	-747.5
Protein (g)	53.4 $\pm$ 12.4	60	-6.6
Fat (g)	71.7 $\pm$ 12.6	20	+51.7
Calcium (g)	286.3 $\pm$ 19.3	600	-313.7
Iron (mg)	16.6 $\pm$ 3.5	17	-0.4
Vitamin A ( $\mu$ g)	1666.3 $\pm$ 221.5	3000	-1333.7
Thiamine (mg)	0.6 $\pm$ 0.3	1.4	-0.8
Riboflavin (mg)	0.8 $\pm$ 0.9	1.6	-0.8
Niacin (mg)	16.8 $\pm$ 8.0	18	-1.2
Vitamin C (mg)	33.7 $\pm$ 4.0	40	-6.3
Folic acid (mg)	62.2 $\pm$ 14.4	100	-37.8

**\*Padhmini, 2018**

The nutrient intake was found out by enquiring through three-day dietary recall. The nutrients were calculated using the standard nutritive value (ICMR, 2016). The mean of the three-day dietary recall was taken and then the mean for the entire transgender nutritive intake was done. Then the standard deviation for the nutrients was also calculated. The transgender consumed fat in excess amount due to the increased snacking habits, it may also be due to increased intake of fleshy foods whereas energy, protein, calcium, iron, vitamin A, thiamine, riboflavin, niacin, vitamin C and folic acid was consumed in deficit amounts. The food frequency of other nutrients are also seen but the quantity of food intake in those groups was noted to be less. The nutrients have a mean

and standard deviation for energy with  $1979.5 \pm 773.3$  Kcal, protein  $53.4 \pm 12.4$  g, fat  $71.7 \pm 12.6$ , calcium  $286.3 \pm 19.3$  g, iron  $16.6 \pm 3.5$  mg, vitamin A  $1666.3 \pm 221.5$   $\mu$ g, thiamine  $0.6 \pm 0.3$  mg, riboflavin  $0.8 \pm 0.9$  mg, niacin  $16.8 \pm 8.0$  mg, vitamin C  $33.7 \pm 4.0$  mg and folic acid  $62.2 \pm 14.4$  mg for the transgender.

### **BMI of the Transgender**

The BMI of the transgender is given in Table XIV.

**TABLE XIV**

#### **BMI of the Transgender**

<b>BMI</b>	<b>Inference</b>	<b>N</b>	<b>%</b>
>18	Underweight	12	8.2
18-23	Normal	34	23.1
23.1-27.5	Over weight	39	26.5
27.6-32.5	Grade I obese	28	19.1
32.6-37.5	Grade II obese	16	10.9
<37.5	Grade III obese	18	12.2
<b>Total</b>		<b>147</b>	<b>100</b>

**\*WHO,2012**

To obtain BMI the weight is divided by the height and the value obtained is compared with the standard and the health status of an individual. By comparing the BMI of the transgender with WHO standard, it was observed that 39 (26.5%) of them are in over-weight category, 34 (23.1%) in normal category, 28 (19.1 %) in Grade I obese category, 18 (12.2 %) in Grade III obese category, 16 (10.9 %) in Grade II obese category and 12 (8.2 %) in under-weight category.

### **Waist-Hip Ratio of the Transgender**

The Waist-Hip Ratio of the transgender is shown in Table XV.

**TABLE XV**

**Waist-Hip Ratio of the Transgender**

<b>Waist-Hip Ratio</b>	<b>No</b>	<b>%</b>
Low risk - 0.9	27	18.4
Moderate risk – 0.9-0.95	71	48.3
High risk - >0.1	49	33.3
<b>Total</b>	<b>147</b>	<b>100</b>

**\*WHO,2011**

The waist hip ratio is an indicator of health status of the individual. It was measured by dividing the waist circumference by the hip circumference. The waist hip ratio of the transgender was compared with WHO standards and it was revealed that 71 (48.3%) of transgender are at moderate risk, 49 (33.3 %) of them are at a high risk and 27 (18.4 %) of them are low risk category.

**D. Morbidity pattern of the transgender**

The morbidity pattern of the transgender is pictured in Table XVI.

**TABLE XVI**

**Morbidity pattern (past 6 months)**

<b>Nature of illness*</b>	<b>No</b>
Cold	36
Fever	25
Vomiting	-
Diarrhoea	5
Others	14
<b>Total</b>	<b>80</b>

**\*Multiple response**

The morbidity pattern of an individual minimum for a period of six months will reflect their exact nutritional status. The morbidity pattern of the transgender was studied which reveals that 36 transgender had cold followed by 25 transgender with fever, 14 with other diseases and 5 transgender with diarrhoea. The transgender faced an issue of severe back pain due to the injection which was injected in the spinal cord on Sex Replacement Surgery (SRS), which made their living hard.

**Duration of Illness**

The duration of illness is shown in TableXVII.

**TABLEXVII**  
**Duration of illness**

<b>Duration*</b>	<b>Frequency</b>	<b>No</b>
Days	<3days	16
	>3days	12
Weeks	<1week	18
	>1week	21
Month	<1month	4
	>1month	9
<b>Total</b>		<b>80</b>

**\*Multiple responses**

The duration of morbidity commonly seen was more than a month among 9 transgender, less than a month among 4 transgender, more than a week among 21 transgender, less than a week among 18 transgender, less than three days among 16 transgender and more than three days among 12 transgender. The frequency of illness was very frequent and this may be due to decreased consumption of immune boosting foods.

**Mode of Treatment**

The mode of treatment of the illness by the transgender is shown in Table XVIII.

**TABLEXVIII**  
**Mode of treatment**

<b>Mode of treatment</b>	<b>No</b>
Allopathy	73
Home remedies	7
Refused treatment	67
<b>Total</b>	<b>147</b>

Allopathy medicine was used by 73 transgender and home remedies was used by 7 transgender to cure if any diseases infections occur in the transgender. Other mode of treatment like homeopathy, ayurveda and siddha was not followed. Many transgender refuse to visit the health care center due to shyness or due to the fear of verbal and sexual harassment.

## **E. Lifestyle pattern of the transgender**

### **Lifestyle Pattern of the Transgender**

The lifestyle pattern of the transgender is discussed in Table XIX.

**TABLE XIX**

**Lifestyle Pattern of the Transgender**

<b>Physical activity</b>	<b>Response</b>	<b>No</b>	<b>%</b>
Exercise pattern	No	147	100
Yoga practice	No	147	100
Meditation practice	No	147	100

Food and physical activity is very essential for staying fit and healthy. On studying the physical activity of the transgender, it was seen that physical activity was completely absent in the transgender. None of the transgender was practicing any physical activity, meditation or yoga. This condition was mainly due to the lack of awareness among them with reference to physical activity.

## **F. Nutritional awareness among the transgender**

### **Nutritional Ideology of the Transgender**

The nutritional ideology of the transgender is elucidated in Table XX.

## TABLEXX

### Nutritional Ideology of the Transgender

Ideas	Pre-educatory		Post-educatory	
	No	%	No	%
Important for health	51	34.7	65	44.2
Important for survival	-	-	-	-
Healthy food	12	8.2	51	34.7
Balanced diet	-	-	11	7.5
Increased life span	11	7.5	-	-
Necessary for daily activity	3	2.1	19	12.8
Improves immunity	19	12.8	1	0.8
Have no idea	51	34.7	-	-
<b>Total</b>	<b>147</b>	<b>100</b>	<b>147</b>	<b>100</b>

Knowing the knowledge level of the individual and providing them with the apt knowledge will help transgender to improve their nutritional status. On studying their ideology about nutrition it was found that before nutrition education the ideology of the participants towards nutrition was important for health, have no idea (51 transgender, 34.7%), improves immunity(19 transgender,12.8%), healthy food (12 transgender, 8.2 %), increases life span (11 transgender,7.5 %) and necessary for daily activity (3 transgender, 2.1 %). After imparting nutrition education their ideology changed to 65 (44.2%) transgender expressing that nutrition is important for health, 51 (34.7%) transgender for healthy food,19 (12.8 %) transgenderfor necessary for daily activity, 11 (7.5 %) transgender for consumption of balanced diet and 1 (0.8 %) transgender improves immunity.

#### **Awareness about Nutrition by the Transgender**

Awareness about aspects of nutrition by the transgender is explained in Table XXI.

**TABLEXXI****Awareness about Nutrition by the Transgender**

Nutritional concepts	Opinion	Pre-educatory		Post-educatory	
		No	%	No	%
Basic V Food Groups	Yes	1	0.7	147	100
	No	146	99.3	-	-
Dieting	Yes	-	-	147	100
	No	147	100	-	-
Nutraceutical property of foods	Yes	96	65.3	147	100
	No	51	34.7	-	-
Energy giving foods	Yes	2	1.4	147	100
	No	145	98.6	-	-
Body building foods	Yes	1	0.7	147	100
	No	146	99.3	-	-
Essentials of vitamins and minerals	Yes	-	-	147	100
	No	147	100	-	-
Importance of water	Yes	147	100	147	100
	No	-	-	-	-

The awareness on the aspects of nutrition was mostly unknown before nutrition education and after nutrition education. The transgender understood the facts and importance about nutrition. The knowledge about Basic V food groups were initially unknown by 146 members and 1 person was familiar about it. Dieting was not known by any of the members. Nutraceutical property of foods was known by 96 members and unknown by 51 members. 145 members were unaware of energy giving food group - cereals whereas 2 members were familiar about this. Body building food groups - pulses, legumes and fleshy foods was known by 1 of them whereas the other 146 members were unaware. The essentials of vitamins and minerals were not known by any of them, but the importance of water was known by all of them. This varied knowledge about nutrition had drastically changed after imparting nutrition education

was all the members had awareness about nutrition topics and became familiar with these terms.

### Nutrition related factors

Awareness on nutrition related factors of the transgender are explained in Table XXII.

**TABLE XXII**  
**Awareness on Nutrition Related Factors of the Transgender**

Topics	Opinion	Pre-educatory		Post-educatory	
		No	%	No	%
Figure consciousness	Yes	96	65.3	147	100
	No	51	34.7	-	-
Junk food unhealthiness	Yes	98	66.6	147	-
	No	49	33.4	-	100
Limiting food intake	Yes	71	48.2	147	100
	No	76	51.8	-	-
Soft drink unhealthiness	Yes	-	-	-	-
	No	147	100	147	100
Nutritious food for healthy living	Yes	147	100	147	100
	No	-	-	-	-

Initially 96 (65.3 %) transgender was figure conscious which reached to all the participants after nutrition education. The ill effects of junk food and soft drinks were taught to all the participants through nutrition education which was initially unknown. 76 (51.8 %) participants did not limit the food intake initially and then realized the importance after nutrition education. The participant's was aware of the fact that nutritious food was essential for healthy living.

### Interest to know about nutrition facts

Interest to know about nutrition facts among the transgender is explained in Table XXIII.

**TABLE XXIII**

**Interest to Know Nutrition facts among the Transgender**

<b>Interest to know about nutrition facts</b>	<b>No</b>	<b>%</b>
Yes	147	100
No	-	-
<b>Total</b>	<b>147</b>	<b>100</b>

All the participants were eager to know about nutrition concepts for healthy living. This helped to achieve the secondary aim of the study to impart nutritional knowledge to the transgender which was more comfortable.

**Impact of Nutrition Education**

Impact of nutrition education among the transgender is shown in Table XXIV.

**TABLEXXIV****Impact of Nutrition Education**

<b>Headings</b>	<b>Score</b>	<b>No</b>	<b>%</b>
Quality of material	Excellent	56	38.1
	Good	88	59.8
	Medium	3	2.1
	Poor	-	-
Understandability	Excellent	112	76.2
	Good	32	21.7
	Medium	3	2.1
	Poor	-	-
Applicability	Excellent	135	91.8
	Good	12	8.2
	Medium	-	-
	Poor	-	-
Presentation	Excellent	141	95.9
	Good	6	4.1
	Medium	-	-
	Poor	-	-

The transgender was provided with basic nutrition knowledge and the impact was studied. The score for the nutrition education given by the participants are 56 (38.1%),

112 (76.2%), 135 (91.8%), 141 (95.9%) for excellent for quality of material, understandability, applicability and presentation respectively. 88 (59.8 %), 32 (21.7 %), 12 (8.2 %) and 6 (4.1 %) transgender commented on good quality of material, understandability, applicability and presentation respectively. The evaluation of nutrition education was graded medium by 3 (2.1 %) transgender for quality of material and understandability.

## G. Other details

### Other details of the transgender

Other details of the transgender is explained in Table XXV.

**TABLE XXV**

### Other Details of the Transgender

Details	Opinion	No	%
Government programs offered	Yes	28	19.1
	No	119	80.9
NGO programs offered	Yes	-	-
	No	147	100
Sex replacement surgery done	Yes	147	100
	No	-	-
Voice training done	Yes	-	-
	No	147	100
Addiction to mobile phone	Yes	97	65.9
	No	50	34.1

Very few transgender *i.e.* 28 (19.1%) transgender expressed their knowledge about the available government programs and expressed the inefficient functioning of these programs whereas 119 (80.9 %) transgender expressed that they were unaware about the programs offered by the government. All of them approved that there was no NGO which helps them exclusively. They all have undergone sex replacement surgery and were unaware of the voice training available for them. 97 (65.9%) of transgender are addicted to mobile phones while 50 (34.1 %) reported they are not addicted to the usage of mobile phone.

### Mental Health of the Transgender

The feeling of stress and recreational activity of the transgender is given in Table XXVI.

**TABLEXXVI**

**Feeling of Stress and Recreational activity of the Transgender**

<b>Feeling of stress</b>	<b>No</b>	<b>%</b>
Yes	119	80.9
No	28	19.1
<b>Total</b>	<b>147</b>	<b>100</b>
<b>Recreational activity*</b>	<b>No</b>	
Listening to music	43	
Chatting with friends	94	
Going to temple	26	
Playing with pets	8	
Dancing	139	
Watching Tik-tok	92	
Others	61	
<b>Total</b>	<b>463</b>	

**\*Multiple response**

The psychological health of an individual is very important which has a direct impact on the food intake of the individual. Only 28 (19.1%) transgender reported to be free from stress whereas 119 (80.9 %) transgender expressed the feeling of stress for varied reasons. Most (139 transgender) of the transgender recreational activity was dancing, followed by 94, 92, 61 and 43 transgender to be involved in chatting, watching tik-tok, other activities and listening to music respectively. Few of them relaxed by going to temples i.e., 26 transgender and playing with pets by 8 transgender.

**H. Vitamin-Mineral assessment**

**Clinical Examination of the Transgender**

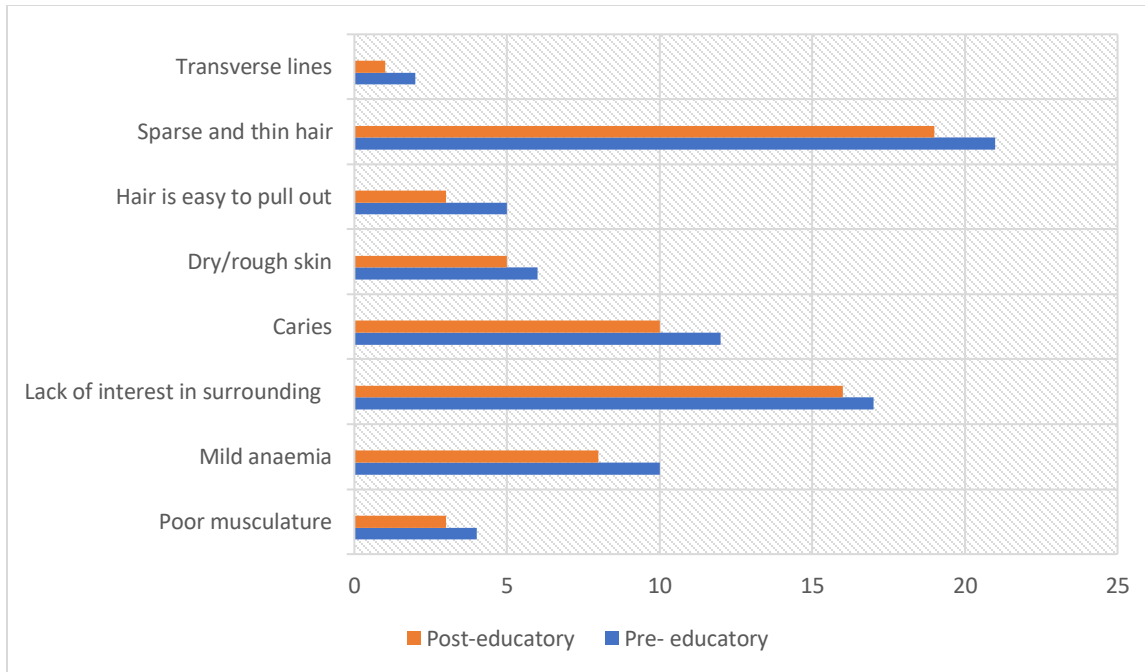
The clinical examination before and after nutrition education of the transgender is elucidated below in Table XXVII and Figure II.

**TABLE XXVII****Clinical Examination of the Transgender**

<b>Symptoms</b>	<b>Pre-educatory results</b>		<b>Post-educatory results</b>	
	<b>No</b>	<b>%</b>	<b>No</b>	<b>%</b>
Poor musculature	4	5.2	3	4.6
Mild anaemia	10	12.9	8	12.3
Inattentive	17	22.1	16	24.6
Caries	12	15.5	10	15.3
Dry/rough skin	6	7.8	5	7.7
Hair is easy to pull out	5	6.5	3	4.6
Sparse and thin hair	21	27.3	19	29.4
Transverse lines	2	2.7	1	1.5
<b>Total</b>	<b>77</b>	<b>100</b>	<b>65</b>	<b>100</b>

**\*Multiple response**

On clinical examination, with the help of a physician it was observed that sparse and thin hair was seen in 21 (27.3%) of the participants, inattentiveness was noted in 17 (22.1 %), dental caries was found in 12 (15.5 %), mild anaemia was noticed in 10 (12.9%), dry/ rough skin was noticed in 6 (7.8 %), easily pluckable hair in 5 (6.5 %), poor musculature in 4 (5.2 %) and transverse lines in nails in 2 (2.7 %) of the transgender before imparting nutrition education. After nutrition education they were again examined and sparse skin with thin hair (19 transgender with 29.4 %), lack of interest in the surrounding (16 transgender with 24.6 %), dental caries (10 transgender with 15.3 %), mild anaemia (8 transgender with 12.3 %), dry/ rough skin (5 transgender with 7.7 %), poor musculature, easily pluckable hair (3 transgender with 4.6 %) and transverse lines in nails (1 transgender with 1.5 %) decreased.



**Figure 2**  
**Clinical examination**

### Vitamin Status

The vitamin status of the transgender using vitastiqs elucidated in Table XXVIII.

**TABLE XXVIII**  
**Vitamin Status of the Transgender**

Vitamins	Status*	Pre-educatory results	Post-educatory results
<b>Fat soluble vitamins</b>			
Vitamin A	Low	115	109
	Mild	21	25
	Good	9	10
	High	2	3
Vitamin D	Low	78	69
	Mild	55	62

	Good	11	13
	High	3	3
Vitamin E	Low	117	111
	Mild	26	31
	Good	3	4
	High	1	1
<b>Water soluble vitamins</b>			
Vitamin B <sub>1</sub>	Low	104	97
	Mild	29	35
	Good	9	7
	High	5	8
Vitamin B <sub>2</sub>	Low	75	69
	Mild	25	31
	Good	28	32
	High	19	15
Vitamin B <sub>3</sub>	Low	117	110
	Mild	28	33
	Good	2	3
	High	-	1
Vitamin B <sub>5</sub>	Low	118	109
	Mild	26	32
	Good	2	4
	High	1	2
Vitamin B <sub>6</sub>	Low	112	108
	Mild	21	27
	Good	11	9
	High	3	3
Folic acid	Low	93	90
	Mild	18	21
	Good	25	26

	High	11	10
Vitamin B <sub>12</sub>	Low	124	118
	Mild	11	16
	Good	9	11
	High	3	2
Biotin	Low	127	121
	Mild	17	21
	Good	3	4
	High	-	1
Vitamin C	Low	98	91
	Mild	28	33
	Good	17	19
	High	4	4

\*0-40-Low, 41-80-Mild, 81-160 - Good, 161-200 - High

The values denote electrical resistant of skin.

The vitamin status of the transgender as studied with the help of vitastiq before and after nutrition education is as follows:

### **Fat soluble vitamins**

#### **Vitamin A**

The vitamin A status was initially in 115, 21, 9 and 2 transgender corresponding to low, mild, good and high status respectively. And after nutrition education the status improved and was 109, 25, 10 and 3 corresponding to low, mild, good and high status.

#### **Vitamin D**

The number of transgender corresponding to low, mild, good and high status are 78, 55, 11 and 3 before nutrition education which had a slight improvement to 69, 62, 13 and 3 after education.

#### **Vitamin E**

117, 26, 3 and 1 members had low, mild, good and high vitamin E levels respectively before nutrition education and after which it turned to 111, 31, 4 and 1 members corresponding to low, mild, good and high status.

### **Water soluble vitamins**

#### **Vitamin B<sub>1</sub>**

The results regarding vitamin B<sub>1</sub> before and after nutrition education, was low status of transgender moved from 104 to 97 members; medium status from 29 to 34 members; good status from 9 to 7 members and high status from 5 to 8 members.

#### **Vitamin B<sub>2</sub>**

The number of transgender corresponding to low, mild, good and high status for vitamin B<sub>2</sub> status are 75, 25, 28 and 19 respectively before nutrition education which had a slight improvement to 69, 31, 32 and 15 respectively after nutrition education.

#### **Vitamin B<sub>3</sub>**

The vitamin B<sub>3</sub> status was initially in 117, 28, 2 and 0 transgender respectively corresponding to low, mild, good and high status respectively. And after nutrition education the status improved to 110, 33, 3 and 1 corresponding to low, mild, good and high status.

#### **Vitamin B<sub>5</sub>**

118, 26, 2 and 1 members had their vitamin B<sub>5</sub> in low, mild, good and high respectively before nutrition education and after which it turned to 109, 32, 4 and 2 members corresponding to low, mild, good and high status respectively.

#### **Vitamin B<sub>6</sub>**

The results regarding vitamin B<sub>6</sub> before and after nutrition education, having low status moved from 112 to 108 members; medium status from 21 to 27 members; good status from 11 to 9 members and high status remained the same.

#### **Folic acid**

The number of transgender corresponding to low, mild, good and high status are 93, 18, 25 and 11 in folic acid before nutrition education which had a slight improvement to 90, 21, 26 and 10 after nutrition education respectively.

### **Vitamin B<sub>12</sub>**

The results regarding vitamin B<sub>12</sub> before and after nutrition education among transgender having low status moved from 124 to 118 members; medium status from 11 to 16 members; good status from 9 to 11 members and high status from 3 to 2 members.

### **Biotin**

The biotin status was initially 127, 17, 3 and 0 corresponding to low, mild, good and high status. And after nutrition education it was 121, 21, 4 and 1 corresponding to low, mild, good and high status respectively.

### **Vitamin C**

98, 28, 17 and 4 members had vitamin C low, mild, good and high respectively before nutrition education and after which it turned to 91, 33, 19 and 4 members corresponding to low, mild, good and high status.

### **Mineral Status**

The mineral status of the transgender using vitastiqis elucidated in Table XXIX.

**TABLE XXIX**  
**Mineral status of the transgender**

<b>Mineral</b>	<b>Status*</b>	<b>Pre-educatory results</b>	<b>Post-educatory results</b>
Calcium	Low	121	118
	Mild	15	19

	Good	7	9
	High	4	1
Chromium	Low	83	78
	Mild	48	52
	Good	9	10
	High	7	7
Glucosamine	Low	76	71
	Mild	37	43
	Good	33	32
	High	1	1
Iodine	Low	12	9
	Mild	19	22
	Good	98	101
	High	18	15
Magnesium	Low	115	107
	Mild	13	19
	Good	9	10
	High	10	11
Manganese	Low	73	69
	Mild	48	51
	Good	16	17
	High	10	10
Omega 3-6	Low	134	132
	Mild	5	6
	Good	8	9
	High	-	-
Potassium	Low	96	92
	Mild	33	35
	Good	14	15
	High	4	5

Selenium	Low	108	102
	Mild	26	31
	Good	7	8
	High	6	6
Sodium	Low	131	127
	Mild	11	14
	Good	4	5
	High	1	1
Zinc	Low	64	58
	Mild	79	83
	Good	3	5
	High	1	1

\*0-40-Low, 41-80-Mild, 81-160 - Good, 161-200 - High

The values denote electrical resistant of skin.

The mineral status of the transgender was studied before and after nutrition education and the results for each mineral is as follows:

### **Calcium**

The number of transgender corresponding to low, mild, good and high status are 121, 15, 7 and 4 before nutrition education which had a slight improvement to 118, 19, 9 and 1 after nutrition education respectively.

### **Chromium**

The chromium status was initially in 83, 48, 9 and 7 transgender corresponding to low, mild, good and high status respectively. And after nutrition education the status improved was 78, 52, 10 and 7 corresponding to low, mild, good and high status respectively.

### **Glucosamine**

76, 37, 33 and 1 member had their glucosamine to be low, mild, good and high respectively before nutrition education and after which it turned to 71, 43, 32 and 1 members corresponding to low, mild, good and high status respectively.

### **Iodine**

The number of transgender corresponding to low, mild, good and high status in iodine are 12, 19, 98 and 18 before nutrition education which had a slight improvement to 9, 22, 101 and 15 after nutrition education respectively.

### **Magnesium**

The magnesium status was initially in 115, 13, 9 and 10 transgender corresponding to low, mild, good and high status respectively. And after nutrition education the status improved to 107, 19, 10 and 11 corresponding to low, mild, good and high status respectively.

### **Manganese**

The number of transgender corresponding to low, mild, good and high status of manganese are 73, 48, 16 and 10 before nutrition education which had a slight improvement to 69, 51, 17 and 10 after nutrition education respectively.

### **Omega 3-6 fatty acid**

The omega 3-6 fatty acid status was initially 134, 5, 8 and 0 corresponding to low, mild, good and high status. And after nutrition education it was 132, 6, 9 and 0 corresponding to low, mild, good and high status respectively.

### **Potassium**

96, 53, 21 and 4 members had low, mild, good and high potassium respectively before nutrition education and after which it turned to 92, 35, 15 and 5 members corresponding to low, mild, good and high status.

### **Selenium**

The results regarding selenium before and after nutrition education, having low status was 108 turned to 102 members; medium status from 26 to 31 members; good status from 7 to 8 members and high status remained the same as 6 members.

### Sodium

The number of transgender corresponding to low, mild, good and high status in sodium are 131, 11, 4 and 1 before nutrition education which had a slight improvement to 127, 14, 5 and 1 after nutrition education respectively.

### Zinc

The zinc status was initially 64, 79, 3 and 1 corresponding to low, mild, good and high status. And after nutrition education it was 58, 83, 5 and 1 corresponding to low, mild, good and high status respectively.

## Association between Food Allergy and Nutrients

The association between food allergy and nutrients is shown in Table XXX

**Table XXX**

### Association between Food Allergy, Nutrients and Clinical Examination

Nutrients	Mean ± Standard Deviation	P Value	R <sup>2</sup> Value
Protein	53.4 ± 12.4	0.01*	0.09
Iron	16.8 ± 2.2	0.05**	0.16
Thiamine	0.6 ± 0.3	0.01*	0.86
Niacin	16.8 ± 8.0	0.01*	0.14
Vitamin C	33.7 ± 4.0	0.01*	0.03

\* Significant cent at one per level; \*\* Significant at five per cent level

The association of food allergy with protein, iron, thiamine, niacin, vitamin C and clinical examination has a mean and standard deviation of 53.4 ± 12.4, 16.8 ± 2.2, 0.6 ± 0.3, 16.8 ± 8.0, 33.7 ± 4.0 and 4.5 ± 2.1. The correlation between food allergy and protein, thiamine, niacin and clinical examination has small positive correlation whereas

the correlation between food allergy and iron and vitamin C has large negative correlation.

### Association between snacking habit and BMI

The association between snacking habit and BMI is shown in Table XXXI.

**Table XXXI**

#### Association between Snacking Habit and BMI

Parameter	Mean ± Standard Deviation	P Value	R <sup>2</sup> Value
BMI	3.3 ± 1.5	0.01*	0.94

\* Significant cent at one per level; \*\* Significant at five per cent level

The association between snacking habit and BMI has the mean and standard deviation as 3.3 ± 1.5 with large positive correlation.

### Association between Educational Status and Nutrients

The association between educational status and nutrients is shown in Table XXXII.

**Table XXXII**

#### Association between Educational Status and Nutrients

Nutrients	Mean ± Standard Deviation	P Value	R <sup>2</sup> Value
Protein	53.3 ± 12.4	0.01*	0.02
Vitamin A	16.7 ± 3.5	0.05**	0.22
Thiamine	0.6 ± 0.3	0.01*	0.58
Vitamin C	33.7 ± 4.2	0.01*	0.02

\* Significant cent at one per level; \*\* Significant at five per cent level

The association between educational status and protein, vitamin A, thiamine and vitamin C has a mean and standard deviation of 53.3 ± 12.4, 16.7 ± 3.5, 0.6 ± 0.3 and 33.7 ± 4.2. The correlation between educational status and protein, thiamine has positive and large positive correlation respectively whereas vitamin A and C has small negative correlation.

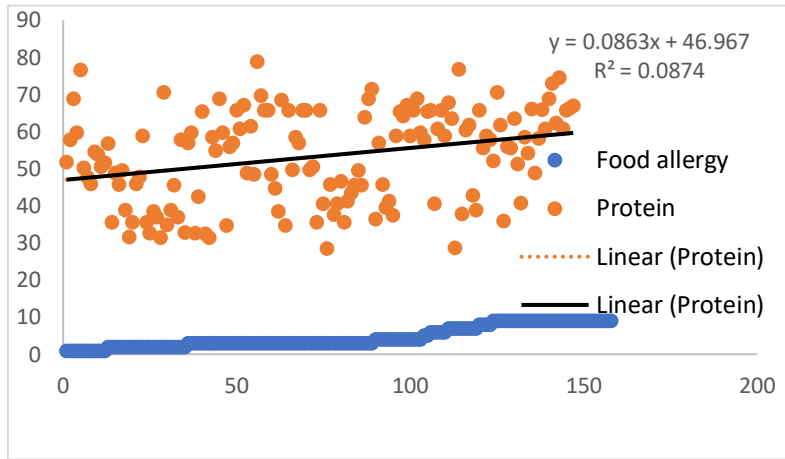


Figure III Figure IV

Correlation of Food Allergy with Protein Correlation of Food Allergy with Iron

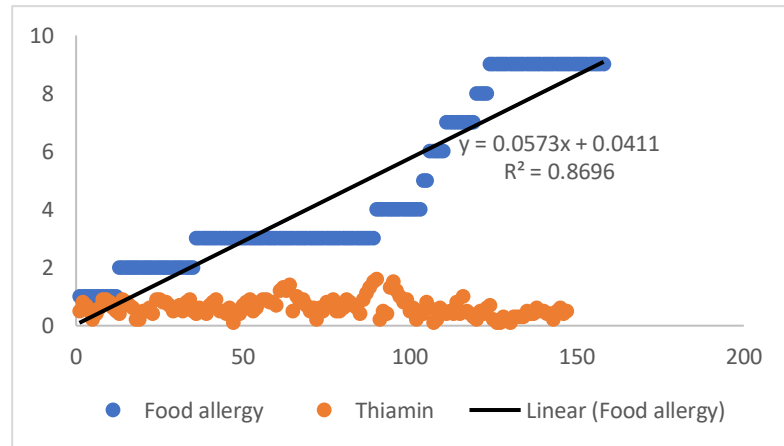
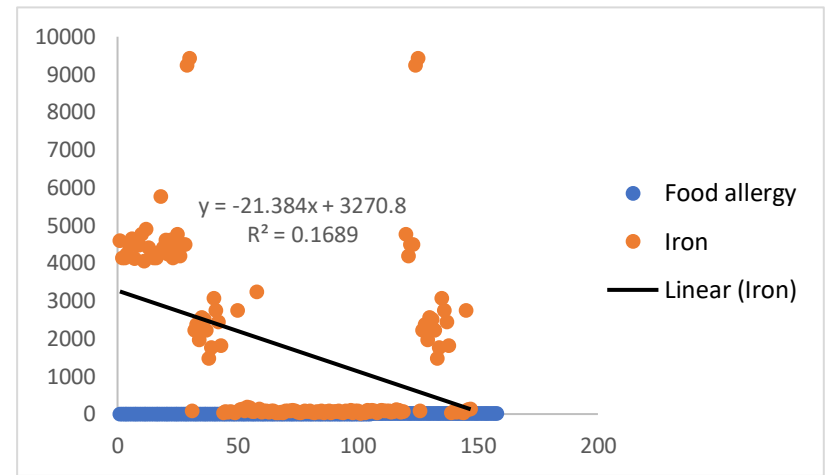
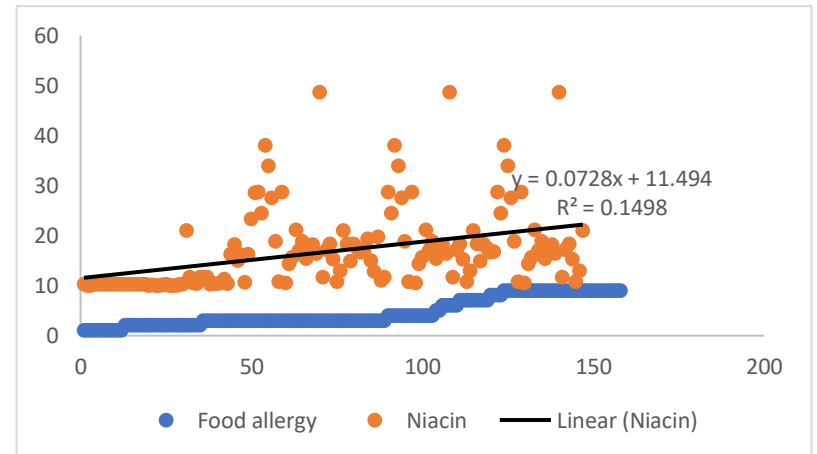


Figure V Figure VI

Correlation of Food Allergy with Thiamine Correlation of Food Allergy with Niacin



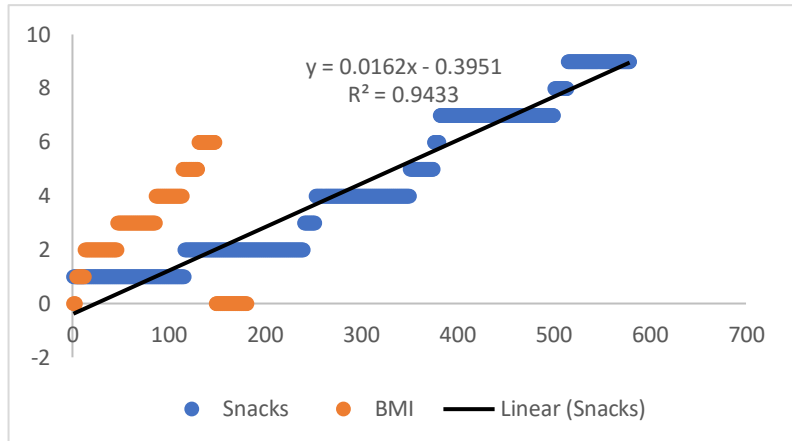
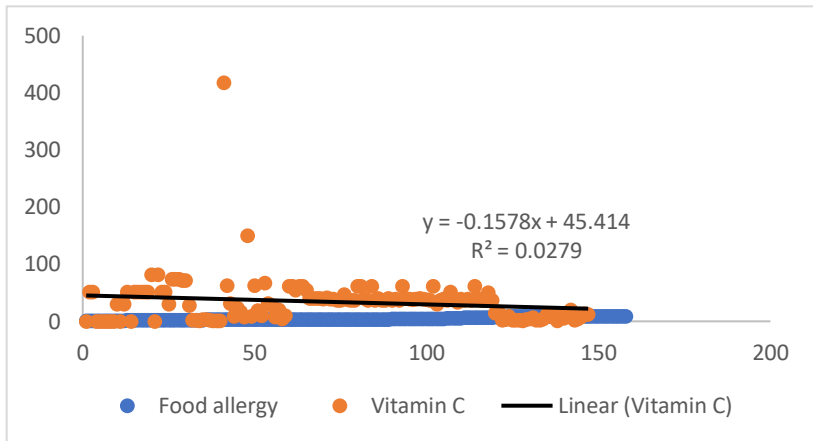


Figure VII Figure VIII

Correlation of Food Allergy with Vitamin C Correlation of Snacking Habit with BMI

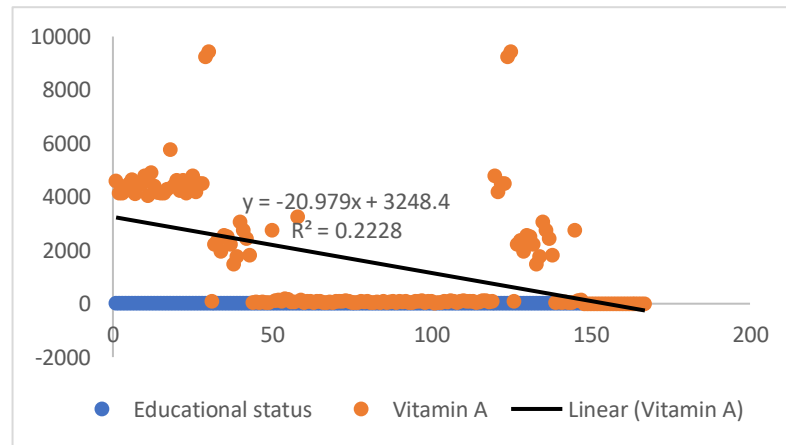
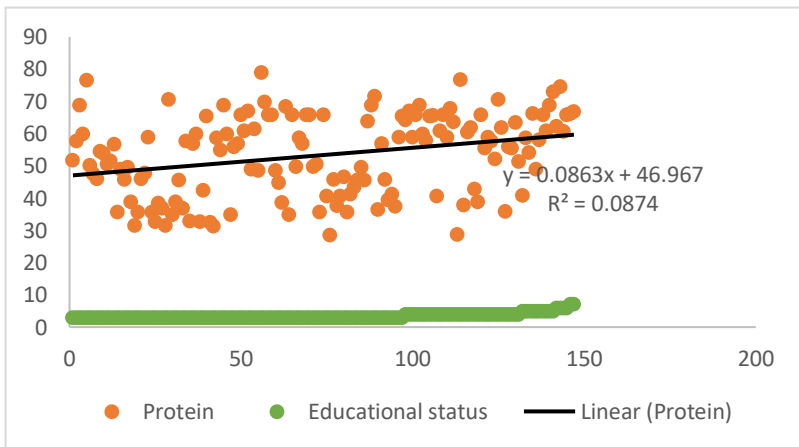
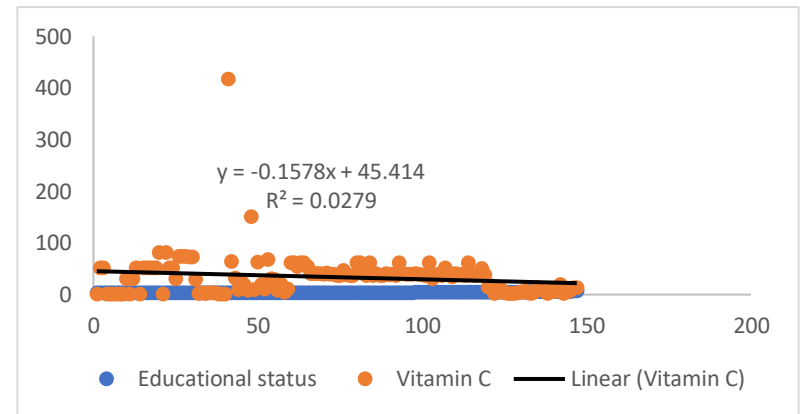
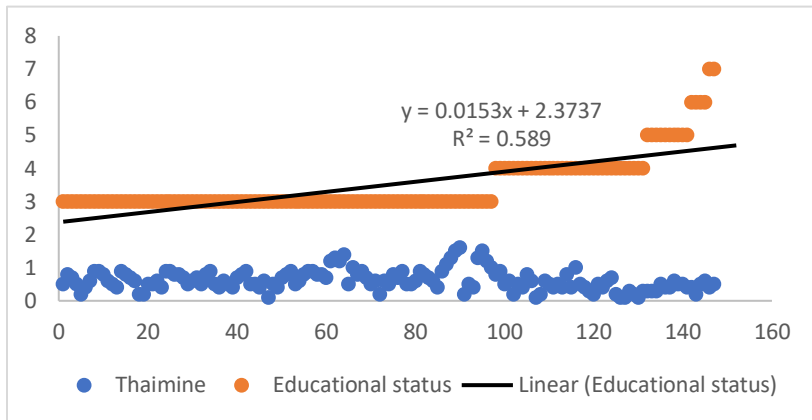


Figure IX Figure X

Correlation of Educational Status with Protein Correlation of Educational Status with Vitamin A



**Figure XI** **Figure XII**

**Correlation of Educational Status with Thiamine** **Correlation of Educational Status with Vitamin C**

The findings of the research were discussed with the help of tables, graphs and statistics. It was found that the transgender had a maximum lifespan till 60 years; they are low economic status people with low educational status following a poor dietary pattern, low in nutrient intake. They had increased food allergy, increased habit of chewing, smoking and drinking. They had increased BMI falling under obese category with poor waist-hip ratio, micronutrient deficiency was evident, morbidity status shows higher incidence for diseases, absence of physical activity and stressed lifestyle.

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**CHAPTER V**  
**SUMMARY AND CONCLUSION**

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## V Summary and Conclusion

According to Hindu mythology transgender are considered as Arthanareeshwara. A transgender goes through a transition phase to change to their desired sex. This involves identification of their gender, sexual orientation, sex reassignment surgery and voice training. There are different types of transgender but Male to Female type was chosen for this study. Keeping in mind that Transgender are also an integral part of the society, this study was started. And it was noted that there are hardly few studies which focussed on Transgender's nutritional status. And on further reviewing it is a shock to know that there is no specific study which was done for Transgender on their micronutrient status. Hence this study was bought into work.

The study entitled “**Micronutrient Status of the Selected Transgenders**” aimed at studying the micro nutrient status of the transgenders. The participants chosen for the study were Male to Female transgender. The data was collected from 147 transgenders. The area selected was Coimbatore and Tirupur district as it could be reached by investigator and for which permission was granted for the same. The tool used for data collection was written questionnaire with close ended questions. Convenient sampling and purposive sampling method was followed. The questionnaire consisted of their socio-economic status, dietary pattern, food frequency both general and micronutrient rich foods. The nutritional assessment was done using anthropometric measurements and three-day dietary recall method. The anthropometric measurements include height, weight, height, BMI, waist circumference, hip circumference and waist-hip ratio. The three-day dietary recall was enquired for their meal pattern followed for three days. The micro nutrient status was found out using clinical examination and vitastiq. The clinical examination denotes a person's clinical symptoms which is seen in their body externally. A standard table with symptoms and the deficit nutrient is quoted, which was used in this study. The other method used to find out micro nutrient status was using non invasive, cheap, convenient and portable pen like device known as the vitastiq. This works with android mobile and detects the micro nutrient status of the individuals. This method was convenient for both the research participants and the investigator. The study was done with the help of Namdhesam NGO who granted permission for the conduct of the study and facilitated with research participants. The initial data

collection was done and the data was collected from the transgenders. Nutrition education session was provided to the transgenders which was scored for quality of material, understandability, applicability of the transgenders and presentation done by the investigator. And one-month time was given for them to practise healthy eating practises as suggested of the investigator. Then a post educatory survey was done among the transgender. Tamil written consent form was signed by the transgender in recognition for accepting to work with the project. This study schedule was presented in the Institutional Human Ethics Committee and the approval was obtained AUW / IHEC 18–19 / FSN/ FHP – 01.

The **salient findings** of this study are briefed as follows:

- The transgender of the study was grouped based on their age to note it for nutritional consideration. In the study, majority (100 transgender with 68.1 %) of the subjects was in the age group of 20-30 years and 31 (21.1 %) of them was below 20 years of age. The minority age seen was between 20-30 years and 30-40 years with 9 (6.1 %) and 7 (4.7 %) transgender respectively. It was astonishing to hear that there was none of the transgender who survived above the age of 60 years and was mainly due to decreased health care centers for the transgender.
- In the democratic country like India, each person is free to choose their religion. Religion gives an individual a belief to move on with. The study participants was mainly interested in Hinduism, Christianity and Muslim religion. There was no evidence for other religions to be followed. Hinduism religion was followed by 131 (89.1 %) of the transgender followed by Christianity and Muslims by 10 (6.8 %) and 6 (4.1 %) transgender respectively.
- On studying the transgender, they were reluctant to mention their caste and were proud to be grouped as transgender only but mentioned their caste just for data. 117 (79.5 %) transgender belonged to backward caste and others namely most backward caste, scheduled tribes, scheduled caste and other caste was with 13 (8.8 %), 7 (4.7 %), 5 (3.5 %) and 5 (3.5 %) transgender respectively.
- It is happy to note that all the transgender has completed at least their primary education and markedly 2 (1.3 %) members have done their technical education. On the other hand, none of them had graduated in professional education. 97 (65.9 %) of the transgender have completed their secondary education, 34 (23.3 %) have completed higher secondary education, 10 (6.8 %) have completed their under

graduate whereas 4 (2.7 %) and 2 (1.3 %) of them have finished their post-graduation and technical education. They should be encouraged to study the course they wish irrespective of their gender.

- The occupation of the transgender was collecting money (104 transgender with 70.7 %) from the general public, dancing (15 transgender with 10.2%), catering (13 transgender with 8.8 %), non-earning (12 transgender with 8.2 %), accountant (1 transgender with 0.7 %), radio jockey (1 transgender with 0.7 %) and auto driver (1 transgender with 0.7 %).
- Based on the occupation chosen they earned an average of Rs. 7,500/- to 15,000/- (101 transgender with 68.7 %), Rs. 4,500/- to 7,500/- (25 transgender with 17.1 %) and above Rs.15,000 (21 transgender with 14.2 %). The economic status of transgender could be improved by accepting them and giving them jobs in the companies and in government sectors.
- The study aimed at finding different types of transgender but all the transgender obtained were Male to Female transgender. No one from the other categories like FTM, cross dresser, drag queen, drag king and gender queer were identified or located by the researcher.
- The dietary pattern as revealed by the transgender was 2+2 meals and snacks per day by 95 (64.6 %) transgender, 3+2 meals and snacks per day by 35 (23.8 %) transgender, other meal pattern by 12 (8.2 %) transgender and 4+2 meals and snacks per day by 5 (3.4 %) transgender. Skipping meals also play an important role in making an individual unhealthy. Skipping of meals was seen among 39 participants in whom 23 transgender skipped their breakfast, 14 transgender skipped lunch and 2 transgender skipped their dinner. Investigating the consumption of beverage will help to make note of the milk consumption of the individual. More than half the transgender interviewed consumed beverages like milk by 64 transgender, coffee by 23 transgender and tea by 18 transgender.
- Many transgender was feeling that usage of drugs is harmful and unethical and did not consume any drugs. But some of them was addicted and some enjoyed using it occasionally. On collecting information, it was noted that the transgender have the habit of smoking (63 transgender) predominantly. The habit of drinking (21 transgender), cool lip (24 transgender) and tobacco (5 transgender) intake was also seen among the transgender. This was used by them for mind relaxing, to have fun and on special occasions.

- The outside catering habits of the transgender was assessed and it was found that all of them ate food in home and hotels as most of them earn their living by collecting money from the public and hence they are out of their houses which make them eat cheap roadside foods. With a frequency of weekly once (113 transgender), monthly once (21 transgender) and occasionally (13 transgender) transgender had food. Due to low purchase parity power they tend to go in for locally available unhealthy foods. The food preferred by most of the transgender was savouries/sweets (124 transgender), soft drinks (119 transgender) and deep-fried foods (116 transgender), followed by juices / soups (98 transgender), other foods (65 transgender), milk shake/ ice-cream (25 transgender), chat items (14 transgender) and pizza / burger(6 transgender).
- Most of the food allergy as expressed by transgender was due to the consumption of buttermilk and lemon juice (54 transgender), followed by the consumption of chicken and crab (23 transgender) and fish and jackfruit (18 transgender). Then cabbage, potato, plantain was allergy to 14 transgender. Mango, papaya, egg, pineapple, jackfruit, mutton was allergy to 12 transgender, Brinjal, yam, tapioca, application of oil by 9 transgender, tomato by 8 transgender, sheep by 5 transgender and tea, coffee, groundnut by 2 transgender. These allergies were caused only on intake of these foods which caused stomach upset, vomiting, cold, fever, lesions on surface of the skin, increased bile secretion, unwanted gas formation, constipation, rashes, heat boils and various other symptoms. This was not noticed when these foods was excluded. But exclusion of certain foods may increase the incidence of nutrition deficiencies. Hence proper supplementation or alternative food source is to be taken to maintain good health.
- It was evident that consumption of fruits, vegetables, milk was minimally consumed daily and was consumed either once or twice in a week. This was consumed in reduced amount because procurement and usage of these foods was costly and cooking time was more. The food frequency of the transgender reveals that cereals, pulses, other vegetables, sugar and oils was used daily by all the transgender. Green leafy vegetables are consumed either once a week (71), weekly twice (65), occasionally (7) and never consumed by 4 transgender. Roots and tubers are consumed weekly once by 73 members, occasionally by 39 members, weekly twice by 32 members and never consumed by 3 members. Fruits are consumed weekly once (45) or twice (73), weekly 3-5 times (21), occasionally (6) and never consumed

(4). Milk and its products are consumed mostly daily (72) and weekly 3-5 times (20). Flesh foods are consumed once a week (71), weekly once (35), daily (26) and occasionally (15). The food frequency could be improved by teaching to choose low cost foods and type of best cooking method to retain nutrients which would be convenient and less time consuming.

- The micronutrient rich foods was listed out in the questionnaire and the food frequency of micronutrient rich foods was calculated by enquiring the transgender about their food frequency towards micronutrient rich foods and was noted. Magnesium and phosphorus are consumed daily by all the transgender. Trace minerals rich foods like liver, poultry, fish, whole grains, soy bean, brown rice, corn oil and pine apple was consumed by 141 transgender. Sodium (140), vitamin E (123), vitamin D (121), vitamin C (113), vitamin B (76), calcium (72) and vitamin A (21) rich foods also was consumed by transgender. The weekly consumption of vitamin A was by 140 transgender, vitamin C, potassium by 65, sodium by 29, trace minerals by 26, vitamin B, vitamin E, magnesium, phosphorus by 25 and calcium by 20 transgender. Monthly consumption of potassium was by 28 transgender, vitamin E by 16, calcium by 15, vitamin C, vitamin D by 12, sodium, trace minerals by 9 and magnesium by 7. Fortnightly consumption of vitamin E, vitamin C by 58, vitamin D by 41, magnesium by 25, vitamin A by 23, potassium by 19, sodium, trace minerals by 18, calcium by 13, vitamin B and potassium by 12 transgender.
- In the present study a meal was considered to be a balanced diet if and atleast three food groups was present. All the transgender consumed a balanced diet when compared with the Basic V food groups.
- The nutrient intake was found out by enquiring through three-day dietary recall. The transgender consumed fat in excess amount due to the increased snacking habits, it may also be due to increased intake of fleshy foods whereas energy, protein, calcium, iron, vitamin A, thiamine, riboflavin, niacin, vitamin C and folic acid was consumed in deficit amounts. The food frequencies of other nutrients are also seen but the quantity of food intake in those groups was noted to be less. The nutrients have a mean and standard deviation for energy with  $1979.5 \pm 773.3$  Kcal, protein  $53.4 \pm 12.4$  g, fat  $71.7 \pm 12.6$ , calcium  $286.3 \pm 19.3$  g, iron  $16.6 \pm 3.5$  mg, vitamin A  $1666.3 \pm 221.5$   $\mu$ g, thiamine  $0.6 \pm 0.3$  mg, riboflavin  $0.8 \pm 0.9$  mg, niacin  $16.8 \pm 8.0$  mg, vitamin C  $33.7 \pm 4.0$  mg and folic acid  $62.2 \pm 14.4$  mg for the transgender.

- By comparing the BMI of the transgender with WHO standard, it was observed that 39 (26.5%) of them are in over-weight category, 34 (23.1) in normal category, 28 (19.1 %) in Grade I obese category, 18 (12.2 %) in Grade III obese category, 16 (10.9 %) in Grade II obese category and 12 (8.2 %) in under-weight category.
- The waist hip ratio of the transgender was compared with WHO standards and it was revealed that 71 (48.3%) of transgender are at moderate risk, 49 (33.3 %) of them are at a high risk and 27 (18.4 %) of them are low risk category.
- The morbidity pattern of the transgender was studied which reveals that 36 transgender had cold followed by 25 transgender with fever, 14 with other diseases and 5 transgender with diarrhoea. The transgender faced an issue of severe back pain due to the injection which was injected in the spinal cord on Sex Replacement Surgery (SRS), which made their living hard.
- The duration of morbidity commonly seen was more than a month among 9 transgender, less than a month among 4 transgender, more than a week among 21 transgender, less than a week among 18 transgender, less than three days among 16 transgender and more than three days among 12 transgender. The frequency of illness was very frequent and this may be due to decreased consumption of immune boosting foods.
- Allopathy medicine was used by 73 transgender and home remedies were used by 7 transgender to cure if any diseases infections occur in the transgender. Other mode of treatment like homeopathy, Ayurveda and siddha was not followed. Many transgender refuse to visit the health care center due to shyness or due to the fear of verbal and sexual harassment.
- On studying the physical activity of the transgender, it was seen that physical activity was completely absent in the transgender. None of the transgender was practicing any physical activity, meditation nor yoga. This condition was mainly due to the lack of awareness among them with reference to physical activity.
- On studying their ideology about nutrition it was found that before nutrition education the ideology of the participants towards nutrition was important for health, have no idea (51 transgender, 34.7%), improves immunity (19 transgender,12.8 %), healthy food (12 transgender, 8.2 %), increases life span (11 transgender,7.5 %) and necessary for daily activity (3 transgender, 2.1 %). After imparting nutrition education their ideology changed to 65 (44.2 %) transgender expressing that nutrition is important for health, 51 (34.7 %) transgender for healthy food, 19 (12.8 %)

transgender for necessary for daily activity, 11 (7.5 %) transgender for consumption of balanced diet and 1 (0.8 %) transgender improves immunity.

- The awareness on the aspects of nutrition was mostly unknown before nutrition education and after nutrition education. The transgender understood the facts and importance about nutrition. The knowledge about Basic V food groups was initially unknown by 146 members and 1 person was familiar about it. Dieting was not known by any of the members. Nutraceutical property of foods was known by 96 members and unknown by 51 members. 145 members was unaware of energy giving food group - cereals whereas 2 members was familiar about this. Body building food groups - pulses, legumes and fleshy foods was known by 1 of them whereas the other 146 members was unaware. The essentials of vitamins and minerals was not known by any of them, but the importance of water was known by all of them. This varied knowledge about nutrition had drastically changed after imparting nutrition education as all the members had awareness about nutrition topics and became familiar with these terms.
- Initially 96 (65.3 %) transgender was figure conscious which reached to all the participants after nutrition education. The ill effects of junk food and soft drinks was taught to all the participants through nutrition education which was initially unknown. 76 (51.8 %) participants did not limit the food intake initially and then realized the importance after nutrition education. The participants was aware of the fact that nutritious food was essential for healthy living.
- All the participants was eager to know about nutrition concepts for healthy living. This helped to achieve the secondary aim of the study to impart nutritional knowledge to the transgender which was more comfortable.
- The transgender was provided with basic nutrition knowledge and the impact was studied. The score for the nutrition education given by the participants are 56 (38.1%), 112 (76.2%), 135 (91.8%), 141 (95.9%) for excellent for quality of material, understandability, applicability and presentation respectively. 88 (59.8 %), 32 (21.7 %), 12 (8.2 %) and 6 (4.1 %) transgender commented on good quality of material, understandability, applicability and presentation respectively. The evaluation of nutrition education was graded medium by 3 (2.1 %) transgender for quality of material and understandability.
- Very few transgender *i.e.* 28 (19.1%) transgender expressed their knowledge about the available government programs and expressed the inefficient functioning of

these programs whereas 119 (80.9 %) transgender expressed that they were unaware about the programs offered by the government. All of them approved that there was no NGO which helps them exclusively. They all have undergone sex replacement surgery and was unaware of the voice training available for them. 97 (65.9%) of transgender are addicted to mobile phones while 50 (34.1 %) reported they are not addicted to the usage of mobile phone.

- Only 28 (19.1%) transgender reported to be free of stress whereas 119 (80.9 %) transgender expressed the feeling from stress for varied reasons. Most (139 transgender) of the transgender recreational activity was dancing, followed by 94, 92, 61 and 43 transgender to be involved in chatting, watching tik-tok, other activities and listening to music respectively. Few of them relaxed by going to temples i.e., 26 transgender and playing with pets by 8 transgender.
- On clinical examination, with the help of a physician it was observed that sparse and thin hair was seen in 21 (27.3%) of the participants, inattentiveness was noted in 17 (22.1 %), dental caries was found in 12 (15.5 %), mild anaemia was noticed in 10 (12.9 %), dry/ rough skin was noticed in 6 (7.8 %), easily pluckable hair in 5 (6.5 %), poor musculature in 4 (5.2 %) and transverse lines in nails in 2 (2.7 %) of the transgender before imparting nutrition education. After nutrition education they were again examined and sparse skin with thin hair (19 transgender with 29.4 %), lack of interest in the surrounding (16 transgender with 24.6 %), dental caries (10 transgender with 15.3 %), mild anaemia (8 transgender with 12.3 %), dry/ rough skin (5 transgender with 7.7 %), poor musculature, easily pluckable hair (3 transgender with 4.6 %) and transverse lines in nails (1 transgender with 1.5 %) decreased.
- The vitamin A status was initially in 115, 21, 9 and 2 transgender corresponding to low, mild, good and high status respectively. And after nutrition education the status improved and was 109, 25, 10 and 3 corresponding to low, mild, good and high status.
- The number of transgender corresponding to low, mild, good and high status are 78, 55, 11 and 3 before nutrition education which had a slight improvement to 69, 62, 13 and 3 after education.
- 117, 26, 3 and 1 members had low, mild, good and high vitamin E levels respectively before nutrition education and after which it turned to 111, 31, 4 and 1 members corresponding to low, mild, good and high status.

- The results regarding vitamin B<sub>1</sub> before and after nutrition education, was low status of transgender moved from 104 to 97 members; medium status from 29 to 34 members; good status from 9 to 7 members and high status from 5 to 8 members.
- The number of transgender corresponding to low, mild, good and high status for vitamin B<sub>2</sub> status are 75, 25, 28 and 19 respectively before nutrition education which had a slight improvement to 69, 31, 32 and 15 respectively after nutrition education.
- The vitamin B<sub>3</sub> status was initially in 117, 28, 2 and 0 transgender respectively corresponding to low, mild, good and high status respectively. And after nutrition education the status improved to 110, 33, 3 and 1 corresponding to low, mild, good and high status.
- 118,26, 2 and 1 member had their vitamin B<sub>5</sub> in low, mild, good and high respectively before nutrition education and after which it turned to 109, 32, 4 and 2 members corresponding to low, mild, good and high status respectively.
- The results regarding vitamin B<sub>6</sub> before and after nutrition education, having low status moved from 112 to 108 members; medium status from 21 to 27 members; good status from 11 to 9 members and high status remained the same.
- The number of transgender corresponding to low, mild, good and high status are 93, 18, 25 and 11 in folic acid before nutrition education which had a slight improvement to 90, 21, 26 and 10 after nutrition education respectively.
- The results regarding vitamin B<sub>12</sub> before and after nutrition education among transgender having low status moved from 124 to 118 members; medium status from 11 to 16 members; good status from 9 to 11 members and high status from 3 to 2 members.
- The biotin status was initially 127, 17,3 and 0 corresponding to low, mild, good and high status. And after nutrition education it was 121, 21, 4 and 1 corresponding to low, mild, good and high status respectively.
- 98,28, 17 and 4 members had vitamin C low, mild, good and high respectively before nutrition education and after which it turned to 91, 33, 19 and 4 members corresponding to low, mild, good and high status.
- The number of transgender corresponding to low, mild, good and high status are 121, 15, 7 and 4 before nutrition education which had a slight improvement to 118, 19, 9 and 1 after nutrition education respectively.
- The chromium status was initially in 83, 48, 9 and 7 transgender corresponding to low, mild, good and high status respectively. And after nutrition education the status

improved was 78, 52, 10 and 7 corresponding to low, mild, good and high status respectively.

- 76, 37, 33 and 1 members had their glucosamine to be low, mild, good and high respectively before nutrition education and after which it turned to 71, 43, 32 and 1 members corresponding to low, mild, good and high status respectively.
- The number of transgender corresponding to low, mild, good and high status in iodine are 12, 19, 98 and 18 before nutrition education which had a slight improvement to 9, 22, 101 and 15 after nutrition education respectively.
- The magnesium status was initially in 115, 13, 9 and 10 transgender corresponding to low, mild, good and high status respectively. And after nutrition education the status improved to 107, 19, 10 and 11 corresponding to low, mild, good and high status respectively.
- The number of transgender corresponding to low, mild, good and high status of manganese are 73, 48, 16 and 10 before nutrition education which had a slight improvement to 69, 51, 17 and 10 after nutrition education respectively.
- The omega 3-6 fatty acid status was initially 134, 5, 8 and 0 corresponding to low, mild, good and high status. And after nutrition education it was 132, 6, 9 and 0 corresponding to low, mild, good and high status respectively.
- 96,53, 21 and 4 members had low, mild, good and high potassium respectively before nutrition education and after which it turned to 92, 35, 15 and 5 members corresponding to low, mild, good and high status.
- The results regarding selenium before and after nutrition education, having low status was 108 turned to 102 members; medium status from 26 to 31 members; good status from 7 to 8 members and high status remained the same as 6 members.
- The number of transgender corresponding to low, mild, good and high status in sodium are 131, 11, 4 and 1 before nutrition education which had a slight improvement to 127, 14, 5 and 1 after nutrition education respectively.
- The zinc status was initially 64, 79, 3 and 1 corresponding to low, mild, good and high status. And after nutrition education it was 58, 83, 5 and 1 corresponding to low, mild, good and high status respectively.
- The association of food allergy with protein, iron, thiamine, niacin, vitamin C and clinical examination has a mean and standard deviation of  $53.4 \pm 12.4$ ,  $16.8 \pm 2.2$ ,  $0.6 \pm 0.3$ ,  $16.8 \pm 8.0$ ,  $33.7 \pm 4.0$  and  $4.5 \pm 2.1$ . The correlation between food allergy and protein, thiamine, niacin and clinical examination has small positive correlation

whereas the correlation between food allergy and iron and vitamin C has large negative correlation.

- The association between snacking habit and BMI has the mean and standard deviation as  $3.3 \pm 1.5$  with large positive correlation. The association between educational status and protein, vitamin A, thiamine and vitamin C has a mean and standard deviation of  $53.3 \pm 12.4$ ,  $16.7 \pm 3.5$ ,  $0.6 \pm 0.3$  and  $33.7 \pm 4.2$ . The correlation between educational status and protein, thiamine has positive and large positive correlation respectively whereas vitamin A and C has small negative correlation.

The study aimed to find out the Micronutrient Status of the Selected Transgenders in which the above findings were observed. Micronutrient status of the transgender need to be improved to an greater extent. This could be achieved by encouraging them to take micronutrient rich foods, by regularising their meals, switching on to nutritious foods, by increasing their purchase parity power by employing them in all sectors, by coming out of their addiction to habits like chewing, smoking and drinking; by consuming foods prepared from home with more frequency, by replacing foods for their allergic foods, by proving good health care services for them, by improving physical activity, by creating awareness among them about nutrition and to live without stress. Government should take steps which would target transgender's nutritional status and provide supplements and schemes that help them to improve their nutritional status and health. Nutritional and health professionals can also take up role in improving their nutritional status by giving them nutritional education, guidance and extending their hand in improving their overall health. On pursuing this, the incidence of micronutrient deficiency will drop. This will improve the nutritional and health status of the locality, thereby state and thereby the nutritional status of the nation. This will create a micronutrient combating INDIA in the near future, which will help the nation to transform to developed country status.

#### **Recommendations for further studies**

- ❖ Formulate the Recommended Dietary Allowance and portion size for Transgender
- ❖ Create awareness about nutritional aspects among transgender and to study the nutritional improvement.

- ❖ Study the biochemical profile of the transgender individuals for nutritional deficiency
- ❖ Formulate a supplementary food for the transgender individuals
- ❖ Study the impact of hormone balance foods on transgender.

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# APPENDICES

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## APPENDIX I Questionnaire

### MICRONUTRIENT STATUS OF THE SELECTED TRANSGENDERS

#### 1. GENERAL INFORMATION

a. Name of the individual:

b. Date of birth:      c .Age(Years):

d. Educational qualification:

f. Phone number:

e. Address:

g. FTM/MTF/Cross-dresser/Drag queens/Drag king/Gender queer    h. Transition age:

#### 2. SOCIO ECONOMIC STATUS

a. Occupation:b.Monthly income:  
 c. Religion: Hindu/ Christian / Muslim / Others      d.Community : OC/BC/MBC/SC/ST

**3. FOOD HABITS AND FOOD PATTERN**

- a) How many meals and snack do you eat each day?  2+2  3+2  4+2  Others
- b) Do you eat food outside home?  Yes  No  
 If Yes, how often do you consume?  Daily  Weekly  Fortnightly  Monthly
- c) Which type of food do you prefer to eat outside (Name them)  
 Fried foods  Pizza/Burger etc  
 Savouries /sweet  Soft drinks  
 Steamed food  Chat items  
 Juices/ Soups  Other  
 Milkshake / Ice cream
- d) Do you skip meals?  Yes  No (if yes specify)  Breakfast  Lunch  Dinner
- e) What beverage do you drink regularly?  Tea  Coffee  Milk  Health Drinks  Others
- f) Do you have the habit of eating  Tobacco  Betel Leaves  Paan  Any Other (Mention duration and quantity)
- g) Do you have the habit of smoking?  Yes  No If yes, what? (mention duration and quantity)
- h) Do you have the habit of drinking?  Yes  No If yes, what? (mention duration and quantity)
- i) Do you have food allergy?  Yes  No If yes, what?

FOOD	ALLERGY CAUSED	WHEN

**4.ASSESSMENT OF NUTRITIONAL STATUS**

a. Anthropometry

Height (cm)	Weight (kg)
BMI	Waist circumference(cm)
Hip circumference(cm)	Waist-Hip Ratio
Chest circumference(cm)	

b. Three day dietary recall

DAY	BREAKFAST	LUNCH	DINNER

**c. Food Frequency**

How often do you eat the following foods? [Put a tick mark in the relevant boxes]

FOODS	DAILY	WEEKLY TWICE	3-5 TIMES IN A WEEK	WEEKLY ONCE	FORT-NIGHTLY	OCCASIONALLY	NEVER
<b>Cereals</b>							
Rice							
Wheat							
Ragi							
Others							
<b>Pulses</b>							
Black gram dhal							
Bengal gram							
Green gram							
Others							
<b>Green leafy vegetables</b>							
Agathi							
Sukiti							
Drumstick leaves							
Others							
<b>Other vegetables</b>							
Drumstick							
Kovaika							
Cabbage							
Others							
<b>Roots and tubers</b>							
Carrot							
Beetroot							
Raddish							
Others							
<b>Fruits</b>							
Apple							
Pomegranate							
Banana							
Others							
<b>Milk and milk products</b>							
Milk							
Cheese							
Others							
<b>Flesh foods</b>							
Chicken							
Mutton							
Beef							
Pork							
Others							
<b>Fish</b>							
<b>Egg</b>							
<b>Sugar and jaggery</b>							
<b>Oil, butter and ghee</b>							

FOOD ITEMS	DAILY	WEEKLY	FORTNIGHTLY	MONTHLY
<b>Vitamin A Rich foods</b>				
Mango				
Papaya				
Green Leafy Vegetables				
Pumpkin				
Egg				
Carrot				
Liver				
Sweet potatoes				
Apricot				
Yellow and orange				
Melons				
<b>Vitamin B rich foods</b>				
Brown rice				
Fish				
Nuts				
Peas				
Guava				
Banana				
GLV				
Soya bean				
<b>Vitamin C rich foods</b>				
Orange				
Guava				
Amla				
Lime				
<b>Vitamin D rich foods</b>				
Mushroom				
Egg				
<b>Vitamin E rich foods</b>				
Mango				
Guava				
Peach				
Papaya				
Pomegranate				
Potato				
Nuts				
Egg				
Rice bran				
Whole cereals				

FOOD ITEMS	DAILY	WEEKLY	FORTNIGHTLY	MONTHLY
<b>Foods rich in Macrominerals</b>				
<b>Calcium</b>				
Milk and products				

GLV				
Egg				
Iron				
Rice flakes				
Ragi				
Leafy vegetables				
Sundakai dry				
Drumstick				
Bittergourd				
Roots and tubers				
Jaggery				
Dates Syrup				
<b>Magnesium</b>				
Rice, wheat				
Nuts				
Soy bean				
<b>Phosphorus</b>				
Rice bran				
Pumpkin				
Cheese				
<b>Potassium</b>				
Dates				
Banana				
Pomegranates				
Apple				
Kidney beans				
Tomato				
<b>Sodium</b>				
Fish				
Cheese				
Pickled foods				
<b>Foods rich in Trace minerals</b>				
Liver				
Poultry				
Fish				
Whole grains				
Soy bean				
Brown rice				
Corn oil				
Pine apple				

**5. MORBIDITY AND EXERCISE PATTERN** a. Illness for past 6 months

Nature of illness	Duration			Mode of treatment			
	Day	Week	Month	Allopathy	Homeopathy	Ayurveda	Others
Cold & Cough							
Fever							
Diarrhoea/Vomiting							
Jaundice							
Dengue							
Swine flu							
Others							

b. Do you exercise?  Yes  No ; If yes

Jogging  Walking  Aerobics  Others ( 15mins  30 mins  45mins  60 mins  more than 1 hour)

c. Do you have the habit of doing yoga?  Yes  No if yes,  15mins  30 mins  45mins  60 mins  <1 hour)

d. Do you do meditate?  Yes  No if yes,  15mins  30 mins  45mins  60 mins  <1 hour)

## 6. CLINICAL EXAMINATION

### i. Hair

- Easily plucked  Dry, brittle hair  
 Alopecia  Corkscrew hair  
 Spooning  Transverse lines

### ii. Nails

### iii. Skin

- Dry and scaly flaky paint  Pallor  Easy bruising  
 Nasolabial seborrhoea  Follicular hyperkeratosis  Hyperpigmentation  
 Psoriasis form rash  Perifollicular haemorrhage

### iv. Eyes

- Night blindness  Xerosis  Retinal field defect  
 Photophobia  Conjunctival inflammation

### v. Mouth

- Glossitis  Cheilosis  Tongue atrophy  
 Bleeding gums  Decreased taste or smell  Loss of tooth enamel  
 Angular stomatitis  Tongue fissuring

### vi. Neck

- Goitre  Parotid enlargement

### vii. Extremities

- Edema  Bone/joint pain  Hyporeflexia  
 Atoxia  Muscle pain  Weakness

### viii. Thorax

- Thoracic rosary

## 7. ASSESSING KNOWLEDGE ABOUT NUTRITION

ea about nutrition?  Important for health  Important for survival

Healthy food  Balanced diet  Increases life span

Necessary for daily activity  Improves immunity  Have no idea

b. Do you take any special care about your food intake?  Yes  No If yes, what?

c. Do you know about Basic V Food groups?  Yes  No

d. Do you have any idea about dieting?  Yes  No If yes, your opinion?

e. Are you figure conscious?  Yes  No If yes, why?

f. Is junk food good for health?  Yes  No If yes, reason?

g. Do you concentrate on what food you choose to eat?  Yes  No

h. Do you know the limit of taking foods?  Yes  No

i. Do you have regularised meal timing?  Yes  No

j. Do you think soft drinks are good for health?  Yes  No

k. Do you believe that choosing nutritious foods will make you healthy?  Yes  No

l. Do you know that certain foods cure us from diseases?  Yes  No

m. Are you aware of foods which help to cure diseases?  Yes  No

n. Do you know which food gives us energy?  Yes  No

o. Do you know which food builds our body?  Yes  No

p. Do you feel vitamins and minerals are essential?  Yes  No

q. Do you think drinking sufficient water is very important for survival?  Yes  No

## 8. OTHER DETAILS

1. Is there any government programs which help your community?  Yes  No (If yes, mention)

2. Is there any NGO which helps your community?  Yes  No (If yes, mention)

3. Did you undergo Sex Replacement Therapy?  Yes  No

4. Are you aware of voice training?  Yes  No (If yes, mention)

5. Do you feel stressed?  Yes  No (If yes, mention)

6. What are your recreational activities?  Listening to music  Chatting with friends  Going to temple  
 Playing with pets  Dancing  Others(mention)

7. Do you feel you are addicted to your mobile phone?  Yes  No

8. What is your special talent? (Mention)

9. If you would like to choose a profession what would it be? (Reason)

10. Are you interested to know more about nutrition and being healthy?  Yes  No

11. Do you like to know anything about nutrition?  
 12. Did I hurt you at any point of my survey?

**9..IMPACT OF NUTRITION EDUCATION**

Score for the nutrition education provided

HEADINGS	QUALITY OF MATERIAL	UNDERSTANDABILITY	APPLICABILITY	PRESENTATION
SCORE				

\*Excellent, Good, Medium, Poor

- idea about nutrition?  Important for health  Important for survival  
 Balanced diet  Increases life span  Necessary for daily activity  
 unity  Have no idea  
 b. Do you know about Basic V Food groups?  Yes  No ; If Yes, list any 2 food groups:  
 c. Is junk food good for health?  Yes  No If yes, reason?  
 d. Do you concentrate on what food you choose to eat?  Healthy  Unhealthy  
 e. Do you have regularised meal timing?  Yes  No  
 f. Do you think soft drinks are good for health?  Yes  No  
 g. Do you believe that choosing nutritious foods will make you healthy?  Yes  No  
 h. Do you know that certain foods cure us from diseases?  Yes  No ; If Yes, mention:  
 i. Do you know which food gives us energy?  Yes  No ; If Yes, mention:  
 j. Do you know which food builds our body?  Yes  No ; If Yes, mention:  
 k. Do you feel vitamins and minerals are essential?  Yes  No ; If Yes, mention:  
 l. Do you think drinking sufficient water is very important for survival?  Yes  No ; If Yes, mention:  
 m. Do you feel convenient to switch to nutritious food?  Yes  No  
 n. Share your experience about learning about nutrition?  Useful  Waste of time  
 o. How you are able to apply it in your daily life?  Easy  Trying to apply  
 Difficult, but must try  Impossible

**10. VITAMIN- MINERAL ANALYSIS BY VITASTIQ**

MEASURED IN HAND

Vitamins and minerals	Biotin	Vitamin C	Magnesium	Vitamin B <sub>1</sub>	Vitamin B <sub>2</sub>	Zinc	Selenium	Vitamin B <sub>6</sub>	Vitamin E	Folic acid
Pre educatory-Status										
Post educatory-Status										

MEASURED IN FOOT

Vitamins and minerals	Chromium	Vitamin A	Glucosamine	Vitamin B <sub>12</sub>	Manganese	Vitamin B <sub>3</sub>	Omega-3-6	Vitamin B <sub>5</sub>	Vitamin D	Calcium
Pre educatory-Status										
Post educatory-Status										

MEASURED IN BODY

Vitamins and minerals	Pre educatory-Status	Post educatory-Status
Potassium		
Sodium		
Iodine		

\*L-Low, M-Mild, G-Good, H-High







**விற்பின் சீ அடங்கிய உணவுகள்**

- பழங்கள் - தெல்லி, கொப்பா, மாமுத்திரைக்காயும் (கரூ), நச்சுத்தீர்ப்பும், புளிப்பான பழங்கள் - தேர்வை, ஏழைச்சீரை, பப்பாசிப்பழம், அன்னாசிப்பழம், வெளுது(ஒலிவ்) கரும்.
- பச்சைநிற இலைக் காய்கறிகளும் - ஏனைய காய்கறிகளும் - முளுக்கை இலை, அகத்தி இலை, வல்லாண்டு, முள்ளாக்கி இலை, பீட்டூட் இலை, முளுக்கை காய், கரிம்காய், தக்காளி.



**இரும்பு உணவு**

- செந்துரியங்களின் முக்கியமான பருந்தாக இரும்பு இரும்புக் கரும்பு ஆனது உடல் மற்றும் மனம் சம்பந்தமான அறிவுத்திறன் குறைவு இன்னமும் அதிகப்படுத்தப் போல் தனித்த தனிபாக கலங்களை உற்பத்தி செய்வதும் செயலாக்கு செயலாக்கு.
- இரும்புக் குறைபாட்டான குருதச் சோகை நோய் ஏற்படும்.
- பச்சை இலைக் காய்கறிகளில் இரும்பு அதிகமாக காணப்பட்டாலும் அதனை அகத்திறமே பெற்றுக் கொள்ளக் கூடிய இரும்பின் அளவைத் தவிர்த்த உணவுகள் குறைவாக அகத்திறமே பெற்றுக் கொள்ளக் கூடிய இரும்பின் அளவைத் தவிர்த்த உணவுகள் குறைவாகவே இருக்கும்.



**இரும்பு அடங்கிய உணவுகள்**

- இலைகள் - கரூ, சீயூர்சீ, மற்றும் சீயூர்சீ நிற இலைச்சீயூர்சீ மரணிய உணவுக்கள், மாட்டினைச்சீ, பங்கி இலைச்சீ, ஆட்டினைச்சீ.
- மின் - வர்ப்பு இன்க்சி, பாண்ட மீன், செவ்வெண் மீன், வாளை மீன், ரெத்தலி மீன், மற்றும் ஏனைய கருவாழ்க்கள்.
- முட்டை - கோழி முட்டை, குயில் முட்டை, வாத்து முட்டை.
- கரும் - பச்சை மற்றும் ஏனைய இலைக் காய்கறிகள் - முளைக்கீரை, சாரண, வல்லாண்டு, கொன்னாக்காய், அகத்தி, கறாந்த, சொல்கேசியா, கரி, மற்றும் பீட்டூட் இலைகள்.
- காய்கறிகள் - தாமிரத்த தண்டு (நாமணக் காய்கறு)
- பருப்பு வகைகள் - அவரை, சோயா அவரை, பயறு, உளுத்த, கடலை, கோது, மற்றும் பட்டாணி.



**போலேட்டு**

- போலேட்டு, விற்பின் பீ (Fe) வகையைச் சேர்ந்த, அனேகமான உணவுகளில் இயற்கையாகக் காணப்படும் ஒன்றாகும். உய்களினுடைய உடலில் புதிய கலங்களை, விசேஷமாக குருதிகலங்களை உருவாக்குவதற்கு போலேட்டு உதவுகின்றது. போலேட்டின் குறையில் குருதினது விருத்திக்கும் மற்றும் நரம்புக் கலங்களின் தொழிற்பாட்டிற்கும் போலேட்டு மிகவும் அத்தியாவசியமானதும்.



**போலேட் அடங்கிய உணவுகள்**

- கரும் பச்சை மற்றும் ஏனைய இலைக் காய்கறிகள் - முளைக்கீரை, கரிமேயிவை, வெள்ளிக்காய், பயிறாக்காய், பசுவிக்கை, பீட்டூட், மற்றும் அனேக காய்கறிகள்.
- பழங்கள் - வாழம்பழம், அன்னாசிப்பழம், ஏழைச்சீர்ப்பழம், அம்பரலிக்காய், தேரை மற்றும் அனேக பழங்கள்.
- பருப்பு வகைகள் - அவரை, சோயா அவரை, பயறு, உளுத்த, கடலை, கோது, மற்றும் பட்டாணி.

**உடற்பயிற்சி, யோகா, தியானம் செய்வதால் பெறும் நன்மைகள்**



**உடற்பயிற்சி செய்வதால் உடலுக்கு கிடைக்கும் நன்மைகள்**

- மன ஆரோக்கியம்
- பதற்றத்தின் அளவு கட்டுப்பாட்டில் இருக்கும்.
- இதய நோய்களை விட்டு விலகி இருக்கலாம்.
- ஆரோக்கியமான உடல் எடையோடு இருக்கலாம்.
- சர்க்கரை நோயை தடுக்கவும் உதவியாக இருக்கும்.
- இரத்த அழுத்தம் வரலவதையும் தடுக்கும்.
- உடல் உறுதி
- நோய் தடுப்பாற்றல் அமைப்பு அதிகரிக்கும்.
- உடலை ஆரோக்கியத்தோடு வைத்திருக்கும்.
- கொழுப்பை குறைக்கும்.
- தசைகளுக்கு வலிமை
- மனநிலையை ஊக்குவிக்கும்.
- நல்ல தூக்கம் வரும்.
- எலும்புகள் ஆரோக்கியமாக வைக்கும்.
- புற்று நோய்கள் வருவதை குறைக்க உதவி புரிகிறது.
- நீண்ட ஆயுள்
- முதுகு வலியை குறைக்கும்
- படிப்பாற்றல் அதிகரிக்கும்.

**யோகா செய்வதால் ஏற்படும் நன்மைகள்**

- மன அமைதி
- உடலுக்கு ஊக்கம்
- இரத்த ஓட்டத்தை அதிகரிக்கும்
- தொப்பையற்ற வலியுறு
- ஆரோக்கியமான இதயத்தை பெற முடிகின்றது
- வலி நிவாரணி
- சீரான சுவாசம்
- சமநிலை
- மன அழுத்தத்தை போக்கும்

**தியானம் செய்வதால் பெறும் நன்மைகள்**

- நோய் எதிர்ப்பு
- உணர்ச்சிமீட்டும் கூடுகின்றது
- உணர்வு சாறுகளை
- மனப்பயிற்சி அழகரிக்கின்றது
- குறைந்த இரத்த அழுத்தம்
- ஆசனத்தின் கூடுகின்றது
- மன அமைதி
- உடலுக்கு வலி வார்ப்பின்றது
- ஆற்றல் மூலிகளை அதிகரிக்கின்றது
- பேரறிவைகள் பெறும்
- அறிவு வளம் பெறும்
- அறிவு வளம் பெறும்
- குறைந்த இரத்த அழுத்தம்
- உடலுக்கு வலி வார்ப்பின்றது
- நோய் எதிர்ப்பு
- உணர்வு சாறுகளை
- மனப்பயிற்சி அழகரிக்கின்றது
- புட்டில் குறைகின்றது



APPENDIX III  
Ethical Clearance



INSTITUTIONAL HUMAN ETHICS COMMITTEE

*Avinashilingam*

Institute for Home Science and Higher Education for Women  
Deemed to be University Under category 'A' By MHRD, (Estd. u/s 3 of UGC Act 1956 )  
Re Accredited with 'A' Grade By NAAC, Recognised by UGC Under Section 12 B  
Coimbatore - 641043, Tamil Nadu, India

**Chairman**

Dr. S. Ramalingam  
Principal, PSG Institute  
of Medical Sciences  
& Research, Coimbatore

**Member Secretary**

Dr.S.Uma Mageshwari  
Professor,  
Dean Student Affairs,  
Department of Food Service  
Management & Dietetics

**Members**

Dr.P.R.Padma  
Mr. K.Arulmoli (Legal Expert)  
Dr. N.S. Rohini  
Dr.Subhashini K. Sripathi  
Dr.A. Saraswathy  
Ms.D.Kavitha  
Dr.S. Muthulakshmi  
Dr.G.Victoria Naomi  
Dr. Judith Justin  
Dr.Anitha Subash

4<sup>th</sup> April 2019

To  
Ms. Deepika.P  
Department of Food Science and Nutrition  
Avinashilingam Institute for Home Science and  
Higher Education for Women  
Coimbatore – 641 043

Dear Deepika.P,

Ref: Your presentation of the proposal  
No. IHEC /18-19/FSN /04 entitled "Micronutrient Status of  
the Selected Transgenders" to the IHEC on 28<sup>th</sup> March 2019

The Institutional Human Ethics Committee of our University hereby grants approval to your research proposal No. IHEC /18-19/FSN /04 entitled "Micronutrient Status of the Selected Transgenders" submitted and presented by you. The Approval number for the same is AUW/IHEC-18-19/FSN /FHP- 01.

We wish you all the best in your research endeavours.

Regards,

*S. Uma Mageshwari*  
Dr.S.Uma Mageshwari  
Member Secretary



## APPENDIX IV Tamil Consent Form

### ஆராய்ச்சித் திட்டங்களுக்கு அறிந்தளிக்கப்பட்ட ஒப்புதல் வடிவமைப்பு

நான் தீபிகா. ப, உணவு அறிவியல் மற்றும் ஊட்டச்சத்து துறையின் கீழ் மேற்கொள்ளப்படும் எனது ஆராய்ச்சித் திட்டத்தின் ஒரு பகுதியாக தேர்ந்தெடுக்கப்பட்ட திருநங்கைகளின் நுண்ணூட்ட நிலை பற்றிய ஆய்வு ஒன்றை மேற்கொண்டு வருகிறார்.

இந்த ஆராய்ச்சிக்கு தனிப்பட்ட விவரங்கள், உணவுப்பழக்க பழக்கங்கள், உயரம், எடை, இடுப்பு சுற்றளவு போன்ற விவரங்கள் தேவைப்படுவேன். ஊட்டச்சத்து கல்வியையும் நான் தருவேன்.

சேகரிக்கப்பட்ட தகவல்கள் முற்றிலும் எனது ஆராய்ச்சிப் பணிக்காக மட்டுமே பயன்படுத்தப்படும். தனிப்பட்ட அடையாளம், எடுக்கப்படும் புகைப்படங்களும் ஆராய்ச்சி நோக்கத்திற்காகவே உள்ளன. எனவே என் ஆராய்ச்சிக்கு ஒத்துழைக்க வேண்டுகிறேன்.

#### ஆராய்ச்சிப் பங்கேற்பாளர் ஒப்புதல்:

ஆராய்ச்சியின் போது கேள்விகள் எதற்கும் பதில் செய்வதில் அசௌகரியமாக இருந்தால், எந்த நேரத்திலும் ஆய்விலிருந்து விலகிக்கொள்வதற்கு எனக்கு உரிமை உள்ளது என்பதை நான் அறிவேன்

ஆராய்ச்சி தொடர்பான சந்தேகங்கள் கேட்கப்பட்டன, ஆய்வாளர் அதை தெளிவுபடுத்தி உள்ளார். இந்த ஆராய்ச்சிப் பணியில் இருந்து எந்த நேரத்திலும் விலகிக்கொள்வதற்கு முழு சுதந்திரம் எனக்கு உள்ளது என்பதை நான் நன்கு அறிவேன்.

இந்த ஆய்வு தொடர்பான மேற்கண்ட தகவல்கள் எனக்கு வாசிக்கவும், ஆய்வாளரால் எனக்கு விளக்கப்பட்டது. அதையே புரிந்து கொண்ட நான், இந்த ஆராய்ச்சியில் பங்கேற்பதற்கு எனது முழு மனதோடு ஒப்புக்கொள்கிறேன். இந்த ஆய்வில் பங்கேற்பதற்கான எனது ஒப்புதலை சுட்டிக் காட்ட எனது கையொப்பமிடுகிறேன்.

#### ஆராய்ச்சிப் பங்கேற்பாளர் கையொப்பம்:



ஆய்வாளர் கையொப்பம் தேதியுடன்:

P. Deefika (13.3.2019)

சாட்சியின் கையொப்பம் பெயருடன்:

Tasleema (TASLEEMA)

