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ARTICLES

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HEALTH DEPRIVATION OF WOMEN IN INDIA AND FALLING SEX RATIO

Dr. D. John Paul

Gender discrimination and its implications have been discussed by social scientists and policy planners for long. The issue has come into prominence since the late 1970s and, of late, there is a growing awareness about this due to the sharp fall in sex ratio (that is, the number of females per thousand males) among children in India and a few other Asian countries. Studies also highlight gender discrimination and neglect of women in terms of allocation of food, medical care, and education in households. In many studies, emphasis is placed on differential outcomes. Among the various factors associated with gender differentials, culture is considered to be an important one. Culture shapes the behaviour of both women and men influences their decision-making differently, thus affecting the outcome.

The main objective of this paper is to highlight the role of socio cultural factors that cause gender discrimination that affect intra household resource allocation. Specifically, it analyses the issues relating to females in terms of mortality and natality, leading to the declining sex ratio in India. It also comments on the existing policies that are not effectively empowering women and have aided the continuing discrimination of women and girl children. The first section discusses how unequal treatment of women is rooted in culture for giving women an inferior status, lesser autonomy, and even lower chances of survival. How the low status of women results in their lower access to the household resources and health care facilities are analysed in this section. It also covers how culture, reinforced by the techno-economic forces, eliminates the girl child. Existence of gender inequality in terms of access to health and nutrition in recent times is discussed in the second section. The third section analyses the differential outcomes of females in terms of mortality, natality, and sex ratio. The fourth section ponders over the low effectiveness of several women-related policies in overcoming their health and survival problems. The concluding remarks are presented at the end.

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The subservient status of women has been maintained over time. Clan exogamy, hypergamy, and patrilocal characteristics of marriage, along with the lower age of brides, reduce the power and autonomy of wives vis-à-vis husbands, and this continues and nurtures inequality through intra-household resource allocation (Sangeri 2012). Moreover, early marriage not only reduces access to education, but also impairs the health condition of women. There are some attempts to explore the processes that reproduce the existing unequal pattern. H.Papanek (1990) examines the methods by which patriarchal perceptions of obligations and behaviour are imposed on women in Asia. She identified 'compulsory emotions' and 'required pains' as the major elements in conditioning women to expect and accept their subordination within the household with low entitlements and patriarchal control of women's labour diminishes the importance of work as an indicator of higher status or greater self-worth, and stresses that economic worth is not only activity valued when families accord status to women.

Culture is a system of interrelated values active enough to influence and condition perception, judgement, communication, and behaviour in a given society (Mazrui 1986). Gender identities and gender relations are critical aspects of culture and they shape the way daily life is lived. The images of women and the roles they play in the family and society are deeply rooted in the myths, legends, religion, and culture.

Women's Status, and Access to Household Resources:

The power relations within the household influence the intra-household resource allocation. Many studies have examined the unequal intra-household resource allocation and its consequences on women and girls in terms of their health, nutrition and mortality. The unfavourable socio-cultural values operate against females- women as well as girls-in the distribution of food, especially when there is food shortage in the family, in South Asia (Sen 1984b). J.C.Caldwell et. Al. (1989), P.Jeffery et al. (1988), and M.Nagla (1997) found that women eat only after men, and whatever is left is divided among the young mother and her female children. Indian women may be malnourished because of the poor nutritive quality of what is available even when they take food. Ethnographic literature reveals that in northern India females are fed lesser in preference than the males (Miller 1981; Harris 1990). Socio cultural values also very often forbid women from taking nutritious non vegetarian food, thus resulting in their nutritional deficiency.

Unfavourable distribution causing poor nutrition becomes evident among females during infancy; it persists through childhood and tends to increase with age. Girls are often neglected soon after their birth; breast feeding is less frequent and for shorter duration for girls than for boys

(IIPS 1995). In a study of two Delhi slums A. Basu (1989) found that only 50-65 per cent of the female infants below the age of One had received adequate nourishment; for female children (5-9 years), the percentage fell to about 30-35.

It cannot be denied that poverty is a major cause of malnutrition and undernourishment. However, its more unfavourable impact on women's nutritional standards show the connivance of poverty and socio-cultural values. Thus, there are some socio-cultural values that reduce women's status in the family and discriminate them in terms of food and nutrition.

Imbalanced Access to Health Care:

Gender constitutes an important dimension of the socio-cultural and political context within which interactions between health service providers and users take place. Gender differentials in health-seeking behaviour and low priority to women's health at the household level very often do not allow early action on women's illness (Mathur 2008) causing more serious health problems. Household surveys typically report more incidence of illness among females than in males (Khan et. Al 1989). Community-based studies also reveal high morbidity among women due to the inadequate medical treatment they receive (Dandekar 1975; Kielmann and Taylor 1983). Women are also responsible for this as they very often accord less importance to their health (Mathur 2008) and may downplay any health problems (and do not avail health care service available) to avoid disrupting domestic duties. This sometimes causes underreporting of their morbidity. Often women need permission and an escort to seek health care. This reduces the demand for modern health care despite the physical availability. Difficulties of physical access and cost of availing health care would further reduce demand by affecting the ability to use (Chatterjee 1990)

Economic Factors causing Gender Discrimination

Women's health and survival, to a large extent, thus depend upon their status, which is an outcome of socio-cultural and techno-economic factors. Entangled in the patriarchal family dynamics and norms, women across the socio-economic layers, and especially among the poor, get the worst deal in health care.

Cultural factors are very often influenced by the economic factors. The care or neglect an individual receives from the household depends to a large extent on her/his economic worth (at present as well as in discriminatory treatment to the female child and to the woman ensues from their low economic worth (Behrman 1990). The male child is preferred over a female child in the household to keep the landholding intact (Sangeri 2012) and to facilitate agricultural activities (Arokiasamy and Goli 2012). Even a girl prefers her brother over her sister as he will give gifts to

her in future (Das Gupta 1987). Employment and high wage-rate increase the economic value of an individual. In India, the preference for male children and the neglect of female children, particularly in the north and especially with regard to the second and later daughters (Miller 1981; Das Gupta 1987) may well be related to low earnings of women. The differential survival chance of the female child may be influenced by the employment or earning opportunities of female adults (Agnihotri et al. 2002). M.Rosenzweig and T.P. Schultz (1982) and S.Kishor (1993, 1995) have confirmed this. Rosenweig and Schultz (1982) also found that an increase in the household's ownership of land is associated with larger survival prospects of female children, holding constant the predicted female employment rate. On the other hand, two national level surveys reveal inverse relationship between land size and sex ratio. S.Siddhanta et al. (2003) also showed that, at the national level and in many large states, sex ratio of 0-14 age-group declines with increasing levels of expenditure.

Gender Discrimination in Food and Health Care:

Gender discrimination in access to nutritious food has been revealed in the National Family Health Survey (NFHS)-3 (IIPS and Macro International 2007). Taking consumption of items (at least once in a week) by men and women in the age range of 15-49 years, the Survey found less percentage of women taking milk and fruit as compared to men(for milk: men,67.2 per cent, women, 55.4 per cent; for fruit: men, 47.4 per cent, women, 35.4 per cent). The adverse effect of culture is more pronounced through its discouragement of women towards the consumption of egg, fish, meat and chicken. In the northern states of Punjab, Haryana and Rajasthan, less than 5 per cent women consume these food items, while in the central states, the eastern states of Bihar and Jharkhand, and the western state of Gujarat a similar situation, though with slight improvement, prevails.

This section examines the impact of care and neglect on children and gives a picture of differential childhood mortality and natality rates. For this, the data of NFHS 2 and 3 and SRS (Sample Registeration System) Survey-2010 have been used. It also analyses the falling sex ratio, which is one of the consequences of gender discrimination.

Premature Mortality among Children:

In three out of the four southern states (namely, Andhra Pradesh, Karnataka, and Kerala), female mortality rates are lower in all ages, which is a good sign. In Maharashtra, Himachal Pradesh, and Odisha also the same thing is noticed, though the level of mortality and healthcare facilities in them differ.

Females have more disease resistance power as compared to males. However, the unfair treatment of the female child has been resulting in higher female death rates, especially with the rise in age, when the effects of endogenous factors decline and those of exogenous factors increase (Bhende and Kanithkar 2003). In case of neo-natal mortality (that is, mortality within the first month of the birth), where the impact of endogenous factors is greater than that of the exogenous factors, female death rates are found lower compared to the male ones in almost all states except in Assam (in NFHS-3) and in Punjab, Haryana, and Tamil Nadu (in NFHS-2). In post neo-natal mortality (death occuring during 1-12 months after birth) rates (PNNMR), in two-third states the female rates are higher, and in child mortality (death rate for children in the age range of 1-4 years) rate (CMR), except in three states, in both surveys, female rates are higher than the male rates.

Improvement in healthcare facilities has reduced the mortality rates, especially PNNMR and CMR in almost all states. Fall in the former has increased the influence of neo-natal mortality rate (NNMR) on infant mortality rate (IMR; number of deaths before age one/1000 live births) during the period 1997-98-2005-06, and it is more in the case of boys than girls. This implies that care of the male child during this period has increased. The same is noticed in the higher female CMR and the still higher gender gap in CMR favouring males in Uttar Pradesh, Punjab, Haryana, and Bihar. Neglect of female child still continues despite economic prosperity and progress in science. The latest SRS bulletin (December 2014) reveals higher female IMR (than male IMR) in almost all states, including Kerala, though decline in the overall as well as the gender gap in IMR is noticed (Registrar General 2014).

Maternal Mortality:

Maternal mortality rate (MMR) measures the number of deaths of women (per lakh live births) due to pregnancy and child birth-related causes. Medical attention at birth to a large extent helps in the reduction of MMR and NNMR. High MMR is an indicator of neglect of women's health. Less care during pregnancy causes complications resulting in the mother's death. In under-developed countries MMRs are high mainly due to the inadequate healthcare facilities. For example, in India, MMR was 750 in the 1960s.It reduced to about 400 in the early 1990s. **IMR – Female-52; MMR : 2010-12 – 178 (12.4%); Life Time Risk – 0.4%.** The states of Bihar, Jharkhand, Odisha, Madhya Pradesh, Chhattisgarh, Rajasthan, Uttar Pradesh and Uttarakhand (these states are known as Empowered Action Group [EAG]) and Assam have higher MMRs compared to the other states. Figure 1 shows group-wise MMR over time. It is observed that MMR has fallen over time, though still is very high in many states (see figure 2). The southern states have had the lowest MMR during these periods. Similarly, a group consisting of rich states like Punjab, Haryana, and

Gujarat and two relatively urban states of West Bengal and Maharashtra had moderate rates during the same period. The EAG category states, including Assam, are poorer and have inadequate healthcare and other infrastructural facilities. It is observed that ante-natal and post-natal care visits as well as the medical attention at birth in these states are very poor.

Health Problems of the Elderly Women:

Gender inequality also persists among the elderly women. In recent years, life expectancy of female has improved and it is slightly higher than that of male. As a consequence, more women tend to be widowed than men. Widows are less empowered due to the erosion of their relation within the family, leading to less access to resources for care and sustenance. Female population is ageing at a faster rate than that of male (Sharma and Xenos 1992). It is important to note that the elderly women suffer not only from ailments specific to ageing, but also from ill-health accumulated over the life-cycle which may manifest in old age in an aggravated form. They may find it difficult to disclose to the younger members, especially if there are gynaecological problems. All these

Table 1: Sex Ratios from 2001 to 2011

States	2001	2011	2001	2011	Fall/Rise (2001-2011)	
	All ages		0-6		All ages	0-6
Haryana	861	877	819	830	-16	-11
Punjab	876	893	798	846	-17	-48
Rajasthan	921	926	909	883	-5	26
Maharashtra	922	925	913	883	-3	30
Gujarat	920	918	883	886	2	-3
Uttar Pradesh	898	908	916	899	-10	17
INDIA	933	940	927	914	-7	13
Bihar	919	916	942	933	3	9
Odisha	972	978	953	934	-6	19
Assam	935	954	965	957	-19	8
Andhra Pradesh	978	992	961	943	-14	18
Tamil Nadu	987	995	942	946	-8	-4
Kerala	1,058	1,084	960	959	-26	1

Note: Due to space constraints, all the small states and some large states have been omitted. However, care has been taken to ensure that the states included represent the different regions of the country.

Source: Census 2001; Provisional Census 2011.

Table 2: Percentage of Districts with OSR<900 (With specific reference to the Census 2011)

States	N	<900
Arunachal Pradesh	16	31.25
Bihar	38	26.32
Haryana	21	90.48
Himachal Pradesh	12	16.66
Jammu & Kashmir	22	63.64
Madhya Pradesh	50	18.00
Maharashtra	35	8.57
Punjab	20	75.00
Rajasthan	33	21.21
Sikkim	4	50.00
Uttar Pradesh	71	50.70
INDIA	640	21.88

Table 3: Sex Ratio at birth (No. of females per 1,000 males)

	All birth-orders		First birth-order		Second birth-order		Third birth-order	
Period	1978-1992	1984-1998	1978-1992	1984-1998	1978-1992	1984-1998	1978-1992	1984-1998
India	943	926	952	935	935	926	935	926
Haryana	909	877	917	909	1000	877	877	775
Punjab	877	833	917	990	901	813	813	735

make them vulnerable to different types of health problems (Chen and Dreze 1995) leading to the deterioration of their health and wellbeing. It is estimated that out of the total missing women about 45 per cent belong to the age-group 45 and above. Missing women at the older age are found in almost all the major states and more so in Bihar, Maharashtra, Madhya Pradesh, Uttar Pradesh, and West Bengal (Anderson and Ray 2012).

Policies related to Women and Girls:

The foregoing analysis reveals many factors, including the cultural barriers, which have been hindering women's empowerment, pointing the need for comprehensive policy measures to address son-preference, effective access to healthcare, and gender inequality. This section analyses the various policies adopted in this regard in post-independent India.

(i) Programmes for health and nutrition:

In the initial years, women's health was being more rigidly equated with reproductive health and, as a result, her general health problems attracted less attention (Qudeer2008). Family planning programmes introduced in the 1950s were designed to reduce the birth rate. These mainly focused on women as targets; sterilization was used as an important tool for that purpose.

(ii) For prevention of daughter elimination:

The state has enacted the pre-Natal Diagnostic Techniques (Regulation and Prevention Of Misuse) Act, 1994 (modified in 2002) to prevent pre-birth sex-determination and girl child abortion. However, abortion continued to take place in millions(chhabra 1996;Ganatara 2000;Arnold el al.2002) due to the connivance of parents with medical practitioners,and lack of exemplary punishment to the technology providers(Visaria 2007;Ghoshal and Dhar 2012).

(iii) Improving the status, condition and acceptability of the girl child:

To improve the conditions of the girl children, their schemes (CCTs)17 have been introduced by the government. By providing money to poor families under certain verifiable conditions, CCTs seek to address short-term income support objectives and also promote long-term accumulation of human capital through supply of health and educational services. These programmes represent a shift in the approach of focusing on the supply-side to a demand driven approach.

(iv) Policies for women's empowerment:

As mentioned earlier, lack of resources is one of the important reasons for women's disempowerment. Hence, there is a need for the provision of resources, including ownership and control of land, for women to reduce the gender gap in the command over resources. The Hindu Succession (Amendment) Act, 2005, which gives all Hindu women (married and unmarried) equal rights with men in the ownership and inheritance of property, in particular agricultural land, needs effective implementation.

Conclusion

Most of the women-related policies have been ineffective in translating their impacts at the individual level due to the slow-changing cultural bias against women. Efforts should be made to tackle the socio-cultural factors and the implicit threat on women for her compliance(K.Basu 2003;Sangari 2012).In such a situation, multi-dimensional strategies are required to reduce the intra-family, inter-family, and community level gender discrimination(Agarwal 1997)and survival of girl child. In the ultimate analyses, policy measures have to transmit to the individual level for shedding her patriarchal attitude so that she can assert her rights over the household and societal resources for her wellbeing. A clear set of social work interventions can be initiated in the form of one or more methods of social work to address these problems.

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"அன்றாடச் செயல்பாடுகளில் தற்காப்பு நடத்தைகள்"

வீ. உதயகுமார்

மனம் என்பது உள்ளம், உளம், நெஞ்சம், மனசு, இதயம், அகம் என பல்வேறு பெயர்களில் வழங்கப்படுகிறது. உள்ளம் என்னும் சொல் அதனிடத்து எழுகின்ற உணர்ச்சிகளையும் எண்ணங்களையும் நினைப்புகளையும் விருப்பு வெறுப்புகளையும் அவற்றால் அறியப்படும் தன்மைகளையும் குணங்களையும் இயல்புகளையும் பெருமை சிறுமைகளையும் பண்பாட்டினையும் குறிப்பதாகும்.

மனம் மூன்று நிலைப்பட்டது.

1.	Id	-	அடிமனம், நனவிலி மனம், ஆழ் மனம்
2.	Ego	-	நனவு மனம், தன்னுணர்வு மனம்
3.	Super Ego	-	மேனிலைமனம், துணை நனவு மனம், இடை மனம்

நனவிலி மனம் (id)

மனத்தின் பெரும்பகுதி நனவிலிமனமாகும். இது ஆளுமையின் அடித்தளமாகும். குழந்தை பிறப்பின் தொடக்கத்திலிருந்து இது தொடங்குகின்றது. மரபு நிலை வழியைப் பெறப்படும் அனைத்தும் இதில் அடங்குகின்றன. நனவிலி மனம் இருப்பதை நேரடியாக உணரமுடியாது. நம் நடத்தையைப் பாதிப்பதன் மூலம் உணரமுடியும். அறியாமல் செய்யும் தவறு நனவிலியின் இயல்புகளாக வெளிப்படுகின்றன.

நனவு மனம் (Ego)

மனத்தினுள் மிகச் சிறியபகுதி நனவு மனமாகும். நனவிலியின் நடவடிக்கையை கவனிக்கின்ற காவல்காரனாக செயல்படும். இது தொடக்கத்திலேயே தோன்றுவதில்லை. சூழ்நிலைக்கு ஏற்ப நடத்தை பொருந்திப் போக வேண்டிய தேவையின் காரணமாக எழுகிறது. உண்மை நிலை கொண்டது. ஒவ்வொரு நடத்தையும் எப்படி வெளிப்பட வேண்டும் என்பதை

கௌரவ விரிவுரையாளர், தமிழாய்வுத்துறை, அறிஞர் அண்ணா அரசு கலைக் கல்லூரி, ஆத்தூர்□636 121.

இது தீர்மானிக்கின்றது. குறிப்பிட்ட ஒரு சமயத்தில் நம்மால் உடனே முற்றிலும் உணரக் கூடிய அனுபவங்கள், மனச்செயல்கள் ஆகியவற்றைக் கொண்டு இது விளங்குகின்றது.

மேனிலை மனம் (Super Ego)

மேனிலை மனம் ஆறு வயதில் தோன்றுகிறது. எண்ணங்கள், நினைவுகள், அனுபவங்கள் ஆகியவற்றை நாம் தற்சமயம் உணர முடியாவிட்டாலும் நமக்கு எப்போது தேவையோ அப்பொழுது நனவு நிலைக்கு உயர்த்தி நம்மை உணரச்செய்கின்றது. பெற்றோர்களும் ஆசிரியர்களும் வலியுறுத்தும் சமூக நடத்தை, அறக்கோட்பாடுகள் போன்றவற்றை உள்ளத்தில் அமைந்து மேனிலை மனத்தை உருவாக்குகின்றது. ஆளுமைச் சமநிலை சீர்குலைந்தால் சிக்கல்கள் தோன்றுகின்றன. அச்சிக்கல்களை ஒருவன் எவ்வாறு சமாளிக்கிறான் என்பதைப் பொறுத்து ஆளுமை அமையும். நனவிலி மனம், நனவு மனம், மேனிலை மனம் ஆகியவை இணைந்து செயலாற்றினால்தான் ஆளுமைச் சமநிலை ஒருவனிடத்தில் தோன்றும் இது தான் இசைவான ஆளுமை ஆகும்.

தற்காப்பு நடத்தை

'தற்காப்பு' என்பது தன்னைக் காப்பது என்று பொருள்படும். மனிதனுக்குப் பல தேவைகள் ஏற்படுகின்றன. அவற்றை நிறைவு செய்ய அவன் பல செயல்களைச் செய்கின்றான். அச்செயல்பாடுகளின் விளைவாகச் சிக்கல்களும் போராட்டங்களும் ஏற்படுகின்றன. அவற்றின் விளைவாக எழும் மன இறுக்கத்தைச் சமாளிப்பதற்காகப் பல உத்திகளைப் பின்பற்றுகின்றான். அவ் உத்திகள் வழிப் பல்வேறு சூழல்களில் பல வகையான தற்காப்பு நடத்தையை வெளிப்படுத்துகின்றான்.

நனவிலிக் கருத்துக்களிலிருந்து தன்னையும் தான் சார்ந்த சமூகத்தையும் காத்துக்கொள்ள வேண்டி ஒருவனுடைய நனவு மனம் பல நடவடிக்கைகளை மேற்கொள்கின்றது. இவற்றையே 'தற்காப்புச் செயல்கள்' (அல்லது) 'தற்காப்பு இயக்கங்கள்' என்பார் ஃப்ராய்ட் குறிப்பிடுகின்றார்.

தற்காப்பின் பன்முகம்

சுதந்திரத்தைத் தன் வரம்புக்கு கொண்டுவர நனவு மனம் தற்காப்புச் செயல்களைச் செய்கிறது. தற்காப்பு இயக்கங்கள் இரண்டு குறிக்கோள்களைக் கொண்டவை ஆகும். அவை,

1. முதல் குறிக்கோள் : வேட்கைகளில் இருந்து தன்னைக் காத்துக்கொள்வது.
2. இரண்டாவது குறிக்கோள் : தாம் சார்ந்த புறவுலகைக் காப்பது.

'தற்காப்பு' என்கிற சொல் மிகவும் ஆழம் பொருந்திய சொல்லாகும். இராணுவ வீரர்கள் நாட்டு எல்லையில் முகாமிட்டு எதிரிகளிடமிருந்து காக்கின்ற நடவடிக்கைக்குத் 'தற்காப்பு' என்று

பெயர். இராணுவத்தினரின் முக்கிய நோக்கம் எதிரிகளிடமிருந்து தன்னைக் காத்துக்கொள்வதே ஆகும். அப்போது தான் தன்னுடைய எல்லைக்குள் எதிரிகள் வராமல் தடுக்கமுடியும். முதலில் 'தற்காப்பு' பின்பு 'எதிர்ப்பு' அமைகின்றது. இது போன்ற படிமுறை தான் உள்ளத்திலும் நிகழ்கிறது.

உணர்வு எழுச்சிகளின் பன்முக வெளிப்பாடுகளே 'தற்காப்பு இயக்கங்கள்' எனப்படும். இத் தற்காப்புச் செயல்களை முதலில் ஃப்ராய்ட் நரம்பு நோயாளிகளிடம் கண்டார். நரம்பு நோய்க்குறிகள் பன்முகத் தன்மையாக இருப்பதற்குத் தற்காப்புச் செயல்களே காரணம் என்று கண்டுபிடித்தார். பிறகு இயல்பான மனிதரிடத்திலும் தற்காப்புச் செயல்கள் நிகழ்வதால் உள்ளத்தின் முக்கிய இயக்கங்களாக இவற்றைக் காண்கிறார் ஃப்ராய்ட்.

தற்காப்பு இயக்கங்கள் அனைத்தும் அமுக்கத்தில் இருந்துதான் தொடங்குகின்றது. அமுக்கம் நிகழாத கட்டத்தில் தற்காப்புச் செயல்களுக்கு இடமில்லை.

அமுக்கத்தையும் தற்காப்பையும் கிட்டத்தட்ட ஒரே பொருளைக் கொண்டு ஃப்ராய்ட் கையாளுகிறார். 'அமுக்கத்தின்' மறு சொல்லாகத் தற்காப்புச் சொல்லைப் பல இடங்களில் பயன்படுத்துகிறார். அமுக்கத்தின் பிறதிகளே தற்காப்புச் செயல்கள் என்பது ஃப்ராய்டின் வாதமாக அமைகின்றது.

ஃப்ராய்டின் மகள் அன்னா ஃப்ராய்ட் நனவுமன உளவியலை வளர்த்தவர்களுள் குறிப்பிடத்தக்கவராவார். அவர் தற்காப்புச் செயல்கள் என்று சிலவற்றை வரிசைப்படுத்துகிறார்.

1. தனிமை (Isolation)
2. செய்யாமை (Undoing)
3. புறத்தேற்றம் (அ) புறத்தெறிவு (Projection)
4. அகத்தேற்றம் (Introjection)
5. தன்னிலைக்குத் திரும்புதல் (Turning)
6. எதிர்நிலைக்கு மாறுதல் (Reversal into Opposite)
7. உயர்வழிப்படுத்தல் (Sublimation)

ஆகியவை நனவுமனத்தின் இன்றியமையா தற்காப்புச் செயல்களாகும்.

தற்காப்புச் செயல்களில் அமுக்கம் மட்டும் உளநிகழ்வாக உள்ளது. மேற்கூறிய அனைத்தும் உள நிகழ்வுகளாக மட்டுமல்லாமல் உள வெளிப்பாடுகளாகவும் உள்ளன. அதாவது, இவையனைத்தும் நடத்தைகள்வழி வெளிப்படுகின்ற தற்காப்புச் செயல்களாகும் அதே சமயம்

நரம்பு நோய்கள் மூலம் அதிகமாக வெளிப்படுபவையாகும். அதனால் தான் தற்காப்புச் செயல்களை நரம்பு நோய்க்குறிகளாக ஃப்ராய்ட் காண்கின்றார்.

தற்காப்பு நடத்தைகள்

நனவிலி மனத்தில் குடிகொண்டு இருக்கும் சிக்கல்களையும் போராட்டங்களையும் பல தற்காப்பு நடத்தைகளாக உளப்பகுப்பாளர் பிரிக்கின்றனர். உளவியல் நூல்களில் அறுபதுக்கு மேற்பட்ட தற்காப்பு நடத்தையினைக் குறிக்கும் சொற்கள் காணப்படுகின்றன. அவற்றுள் இன்றியமையாதவை,

1. அகநேக்குடையன (Introversion)
2. பகல் கனவு காணுதல் (Fantasy or Day Dreaming)
3. புறத்தெறிதல் (Projection)
4. காரணம் கற்பித்தல் (Rationalisation)
5. ஈடு செய்தல் (Compensation)
6. ஒன்றுதல் (Identification)
7. பின்னோக்கம் (Regression)
8. இடமாற்றம் (Displacement)
9. மடைமாற்றம் (Sublimation)
10. பின்வாங்கல் (Withdrawal)

அகநோக்குடைமை

ஒருவன் பிறருடன் கூடிப் பழகாமல் தனிமையாக ஒதுங்கி வாழ முற்படுகின்றான். அவ்வாறு அவனாகவோ அல்லது பிறராலோ தனிமைப்படுத்தப்படும்போது அவனுக்குள் பொருத்தப்பாடற்ற நடத்தை ஏற்படுகிறது. அகநோக்குடைமை தீவிரமாயின் அவன் சமூக எதிரியாகவும் மாறும் வாய்ப்பு ஏற்படுகிறது.

அன்னா ஃப்ராய்ட் தற்காப்புச் செயல்களை வரிசைப்படுத்தும்போது தனிமை என்பதை முதலாவதாகக் குறிப்பிடுகிறார். அவர் குறிப்பிடும் 'தனிமை' என்பது அகநோக்குடைமை சார்ந்ததாகும்.

'தனிமை' என்பது மற்றவர்களிடமிருந்து விலகித் தனித்து இருத்தலைக் குறிக்கும். அது

மட்டுமல்லாமல் தம்மைப் பிறர் தொடுவதை எதிர்ப்பதும் தனித்தலின் இன்றியமையா குணமாகும். உள நிகழ்விலும் இதே அடிப்படையில்தான் தனிமை நிகழ்கிறது.

நனவிலிக் கருத்துகளின் தொடர்பிலிருந்து தப்பித்துக் கொள்ளும் நனவு எண்ணங்களின் செயல்பாடுகள் தனிமை அடிப்படையானவையாகும்.

தீட்டு என்கிற பெயரில் நடக்கின்ற தீண்டாமை எனும் சமூக நடத்தை தனிமையின் வெளிப்படாகும். பொருளாதார ஏற்றத்தாழ்வில் ஏற்படுகின்ற இடைவெளி கூட தனிமையின் வெளிப்பாடாகும். பெண்களின் மாதவிலக்கு மரபு வழிப்பட்ட தனிமை எனும் தற்காப்புச் செயலாகும். தீண்டுதல், உடல் தொடர்பு ஆகியவை உள்ளுணர்ச்சிகளின் உடனடிக் குறிக்கோளாக இருந்தாலும் அவற்றைப் புறக்கணிப்பது ஒருவகையான தற்காப்பு நடவடிக்கையே என்பார் ஃப்ராய்ட்.

அகநேக்குடைமையைக் கட்டுப்படுத்துவதற்கு அல்லது குறைப்பதற்குச் செய்ய வேண்டியது, எந்தச் சூழ்நிலையிலும் ஒருவரைத் தனித்து ஒதுக்கித் தனிமைப்படுத்தக் கூடாது. உறவினரையோ, நண்பர்களையோ, மாணவர்களையோ, அல்லது பிறரையோ ஒதுக்கித் தனிமைப்படுத்தாமல் ஒன்றாக இணைத்து வாழும்போது அகநோக்குடைமை தீவிரமடைவதைத் தடுக்கமுடியும்.

பகல் கனவு காணல்

மனதில் அமுக்கப்பட்ட இச்சைகளே கற்பனை மூலம் பகல் கனவாக வெளிப்படுகிறது. பகல் கனவுகளில் நாயகனாகத் தோன்றுபவன் கனவு காண்பவனே ஆவான். பகல் கனவுகள் இருவகைப்படும் அவை,

1. கனவு காண்பவன் வெற்றி கொண்டு வீரனாகத் திகழ்வான்.

2. தியாகி போல் துன்பப்படுவான்.

பகல் கனவு காண்பது தவறு என்று கூற முடியாது. ஆனால் அது தீவிரமடைந்தால் நிகழ்கால வாழ்வில் கனவு காண்போனைத் தனிமைப்படுத்திவிடும்.

கற்பனை செய்வது தவறு அன்று. எனினும் கற்பனையிலிருந்து விடுபட்டு நிகழ்கால வாழ்வில் தனது ஆற்றல்கள் அனைத்தையும் ஒருங்கிணைத்துத் தான் கண்ட கனவை அடைவதற்கு முயற்சி செய்பவனுக்குப் பகல் கனவு ஆக்கச் சிந்தனைக்கு வழிவகுக்கும். நினைத்த இலக்கை அடையப் பகல் கனவை அதாவது கற்பனையைச் சரியான முறையில் பயன்படுத்தும்போது அது நமக்கு வெற்றியைத் தேடித்தரும்.

உதாரணம்

- ✓ வகுப்பில் சரியாகப் படிக்காத மாணவன் ஒருவன் நன்றாகப்படித்து மாவட்ட ஆட்சித்தலைவராகப் பணியாற்றுவது போல் கனவு காணக்கூடும்.
- ✓ பிறர் துன்பப்படுவதைக் கண்டு மகிழக்கூடிய ஒருவன் பிறருக்காகத் துன்பப்படுவது போல் கனவு காணக்கூடும்.
- ✓ இருசக்கர வாகணம் ஓட்ட தெரியாத ஒருவன் கார் பந்தயத்தில் முதல் இடம் பிடித்து வெற்றி பெறுவது போன்று கனவு காணக் கூடும்.

புறத்தெறிதல்

நம்மிடம் காணப்படும் இச்சைகளும் மனவெழுச்சிகளும் உளச்சிக்கல்களும் பிறரிடமும் காணப்படுகின்றன என்பதை அறிந்து அதற்கேற்பச் செயல்படுதலே புறத்தெறிதல் ஆகும். தனது தோல்விகளையும் குறைபாடுகளையும் மற்றவர்கள் மீது ஏற்றிக் கூறுதல் புறத்தெறிதல் ஆகும்.

புறத்தெறிதலில் நம்மை நாமே ஏமாற்றிக் கொள்கிறோம். நம்மிடம் இருக்கின்ற குறைபாட்டை நம்மைச் சார்ந்தவர்கள் எடுத்து கூறும் போது அக்குறைபாட்டை நீக்குவதற்கு முயற்சி செய்ய வேண்டும். அப்படி முயற்சி செய்யாமல் எந்த ஒரு செயலுக்கும் விதியின் செயல் என்பதும், தனக்கு அதிர்ஷ்டமில்லை என்று கூறுவதும், நேரம் சரியில்லை என்று கூறுவதும் வழக்கமாகிவிட்டன. இவற்றைக் குறைத்துக்கொள்வதற்குத் தோல்வியைக் கண்டு சோர்வு அடையாமல் மீண்டும் மீண்டும் முயற்சி செய்யும் போது புறத்தெறிதல் என்ற தற்காப்பு நடத்தை படிப்படியாகக் குறையத் தொடங்குகின்றது.

புறத்தேற்றம் என்கிற சொல் அகநிலை இயல்புகளைப் புறநிலையில் ஏற்றிப் பார்ப்பதைக் குறிக்கிறது. மேலும் புறச்சார்புக் கருத்துகளை அகச்சார்புடையதாக பாவிக்கின்ற செயலையும் இது குறிக்கும் இச்செயல் மூலம் புறநிலை, அகநிலையின் பிம்பமாகிவிடுகிறது.

புறத்தேற்றமும் அகத்தேற்றமும் வாய் உணர்ச்சியின் பெருமுகங்கள் என்று ஃப்ராய்ட் கூறுவார். குழந்தைப் பருவத்தில் வாய்ப் பருவம் தான் முதலில் அமைந்துள்ளது. இப்பருவத்தில் பாலை(அ)உணவை வேண்டாத பொருளைத் துப்புவதன் மூலம் புறத்தேற்றத்தையும் குழந்தை நனவுமனப் பட்டறிவாகப் பெறுகிறது.

தனக்கு வேண்டியதைப் பெறுவதில் இன்பம் காண்பது அகத்தேற்றமாகும். தனக்கு ஒவ்வாததைப் புறந்தள்ளி இன்பம் காண்பது புறத்தேற்றமாகும். இதனால் அகத்தேற்றத்திற்கு அகநிலையும் புறத்தேற்றத்திற்குப் புறநிலையும் மையக்கருவாக விளங்குகின்றன.

உதாரணம்

- ✓ வகுப்புக்குத் தாமதமாக வரும் மாணவனைப்பார்த்து ஆசிரியர் தாமதமாக வருவதற்கு என்ன காரணம் என்று கேட்கும் போது அதற்குப் பேருந்து வரவில்லை என்று கூறுவான். தனது தவறையும் குறைபாட்டையும் மறைத்துவிட முயல்வான்.
- ✓ கடை முதலாளியிடம் ஏன் இந்த ஆண்டு அதிகப்படியான இழப்பு வந்துவிட்டது என்று கேட்டால் அதற்கு இந்த வருடம் நேரம் சரியில்லை என்று கூறுவது புறத்தெறிதல் ஆகும்.

காரணம் கற்பித்தல்

தனது தவறுகளுக்கும் இயலாமைக்கும் உரிய உண்மையான காரணங்களை விடுத்து சமுதாயத்தினரால் ஏற்றுக்கொள்ளக் கூடிய பொருத்தமான வேறு காரணங்களைத் தேடிக் கண்டுபிடித்துக் கூறுதலே 'காரணம் கற்பித்தல்' அல்லது 'காரணம் புனைந்துரைத்தல்' ஆகும்.

புறத்தெறிதல் என்னும் பண்பு தீவிரமானால் அது நம்மை நாமே ஏமாற்றிக் கொள்ளும் நிலையினைத் தோற்றுவிக்கும். ஆனால், 'காரணம் கற்பித்தல்' தீவிரமானால் பொய் பேசுவதன் மூலம் நாம் பிறரை ஏமாற்றுகிறோம் என்பதாகும்.

காரணம் கற்பித்தலிலிருந்து நாம் மீண்டு வெளிவருவதற்குப் பொய் பேசுவதைத் தவிர்த்துக் கொள்ள வேண்டும். ஒரு தவறை மறைக்கக் காரணம் கற்பிப்பது, அந்த காரணத்தை மறைப்பதற்கு வேறு ஒரு காரணம் சொல்வது என்று இப்படி நீண்டு கொண்டே சென்றால் பல பிரச்சனைகளும் போராட்டங்களும் வந்து சேரும். இதன் மூலம் மனப்பிறழ்வு ஏற்பட வாய்ப்புள்ளது.

இதைக் குறப்பதற்கு நடந்த உண்மை நிகழ்வுகளை வெளிப்படையாக கூற வேண்டும். அப்படிக் கூறும் போது நம் மீது தவறு இருந்தாலும் அது நம்மை அதிக அளவில் பாதிப்பை ஏற்படுத்தாது. இல்லையேல் மனப்பிறழ்வை ஏற்படுத்த வாய்பு உள்ளது.

உதாரணம்

- ✓ கடன் வாங்கிய நபரிடம் கடன் கொடுத்தவர் பணத்தைத் திருப்பி கேட்டால் அதற்கு நீங்கள் வருவதற்கு முன்பு வரை கையில் இருந்தது. இப்பொழுதுதான் பொருள் வாங்கக் கொடுத்துவிட்டேன் என்று கூறுவான். பணம் இல்லை என்பதை மறைப்பதற்குக் காரணம் கற்பிப்பான்.
- ✓ வகுப்பில் ஒப்படைவை ஆசிரியர் கேட்டால் வீட்டில் மறந்து வைத்துவிட்டேன் என்று கூறுவார்கள். எழுதாமல் வகுப்புக்கு வந்துவிட்டதைச் சரிசெய்யக் காரணம் கற்பிப்பார்கள்.

ஈடுசெய்தல்

தன்னிடம் காணப்படும் குறைபாட்டினைப் பொருட்படுத்தாமல் அக்குறைபாட்டினை ஈடுசெய்யும் வகையில் தனது சக்தி முழுவதையும் வேறொரு செயலில் செலுத்தி வெற்றி காண விழைவது ஈடுசெய்தல் எனப்படும். ஒரு துறையில் ஏற்படும் மனமுறிவினைப் போக்க வேறொரு துறையில் அதிக அளவு ஆர்வம் செலுத்துவது ஈடுசெய்தலாகும். ஈடுசெய்தல் மூலம் போட்டி மனப்பான்மை அதிகரிக்கிறது. சமுதாயங்களில் ஈடுசெய்தல் அதிக அளவில் காணப்படுகிறது.

ஈடுசெய்வதற்கு அடிப்படைக் காரணம் தாழ்வு மனப்பான்மையே ஆகும். ஈடுசெய்தல் சமுதாயத்தால் ஏற்றுக்கொள்ளக் கூடியதாக இருந்தாலும் ஈடுசெய்தலை மீண்டும் மீண்டும் கையாளும் போது சமுதாயத்தால் வெறுத்து ஒதுக்கப்படும் நடத்தைகளாக மாறும் சூழல் ஏற்படுகிறது. இதிலிருந்து நாம் வெளிவருவதற்கு நமக்குள் இருக்கும் தாழ்வு மனப்பான்மையை நீக்கினால் ஈடுசெய்தல் படிப்படியாகக் குறையத் தொடங்கும்.

உதாரணம்

- ✓ கருப்பு நிறம் உடையவனை அனைவரும் விலக்கும் போது அவன் அனைவரின் கவனத்தைத் தன் பக்கம் திருப்ப வேண்டும் என்று திரைப்படங்களில் நடிப்பது.
- ✓ படிப்பில் சிறந்து விளங்க முடியாதவன் தொழிலில் சிறந்து விளங்குவது.
- ✓ ஆங்கிலப் பாடத்தில் தேற்சி பெற முடியாத மாணவர் கணிதத்தில் முதல் வகுப்பில் தேர்ச்சி பெறுவது.

ஒன்றுதல்

நம்மால் வெளிப்படுத்த முடியாமல் ஒடுக்கப்பட்ட இச்சைகளும் தேவைகளும் வேறொருவரது நடத்தையில் வெளிப்படும் போது அவற்றைக் கண்டு இரசிப்பதன் மூலம் ஓரளவு நிறைவு பெறுதலே ஒன்றுதலாகும்.

உதாரணம்

- ✓ நமக்கு எப்பொதும் துன்பத்தைத் தரக்கூடியவரை நம்மால் தண்டிக்க முடியாத பொழுது அவரை மற்றொருவர் தண்டிப்பதைப் பார்த்து நிறைவு பெறுவது ஒன்றுதலாகும்.

பின்னோக்கம்

தான் எதிர் கொண்டுள்ள மனப்போராட்டங்களிலிருந்து விடுபட ஒருவன் தன்னையும் அறியாமல் வளர்ச்சிப்படிகளில் கீழறங்கிச் சிறுபிள்ளையைப் போல் செயல்படுவது பின்னோக்கம் எனப்படும். இப்பின்னோக்கம் ஒருவரின் எல்லாச் செயல்களிலுமோ அல்லது குறிப்பிட்ட ஒரு

வாழ்க்கை நிகழ்வுகளில் எழும் பிரச்சனைகளை மட்டும் பொறுத்தோ அமையக்கூடும்.

உதாரணம்

- ✓ பெரியவர்கள் பிரச்சனைகளைக் கண்டு பயந்து அதைத் தீர்ப்பதற்கு வழிதெரியாமல் அவருக்குக் கீழ் இருப்பவரை நீ இந்த பிரச்சனையைப் பார்த்து முடித்துவிடு என்று கூறுவது பின்னோக்கமாகும்.
- ✓ வீட்டை விட்டு வெளியேறி விடுவேன் என்று பயமுறுத்துவது, பிறரிடம் பேச மறுப்பது போன்ற குழந்தைத்தனமானச் செயல்களை வயது வந்தவர்களும் வெளிப்படுத்துதல் பின்னோக்கமாகும்.

இடமாற்றம்

ஒரு குறிப்பிட்ட ஊக்கி அல்லது மனவெழுச்சி இயல்பான தன்னுடன் தொடர்புடைய பொருளிலிருந்து விலகி முற்றிலும் தொடர்பில்லாத வேறோரு பொருள் அல்லது ஊக்கியின் பால் செல்லுதலே இடமாற்றம் அல்லது நிலைமாற்றம் எனப்படும்.

'பலிகடா ஆக்கப்படுதல்' இத்தகைய தற்காப்பு நடத்தையின் பால்பட்டதே. இடமாற்றம் பெரும்பாலும் கோபத்தின் காரணமாக எழுகின்றது.

நாம் செய்யும் ஒவ்வோரு செயல்பாட்டையும் பொறுமையாகச் செய்ய வேண்டும். பதட்டத்துடன் செய்யக்கூடாது. அவ்வாறு செய்யும்பொழுதான் வெற்றியைப் பெறமுடியும்.

நாம் செய்யும் செயல்பாடுகளில் நல்லவற்றை எடுத்துக்கொண்டு தீயவற்றை விட்டு ஒதுக்க வேண்டும். மனதை நிதானமாக வைத்துக்கொண்டு வேரொரு செயலில் ஈடுபட்டால் இடமாற்றத்தைத் தவிர்க்க முடியும்.

உதாராணம்

- ✓ தொழிலில் இழப்பு ஏற்பட்டால் அதைத் தாங்கி கொள்ள முடியாமல் அனைவரிடமும் மிகக் கடுமையாக நடந்து கொள்ளவது.
- ✓ நண்பர்களுக்கு இடையில் ஏற்பட்ட பிரச்சனையால் வீட்டில் இருக்கும் அனைவரிடத்திலும் கோபத்தைக் காட்டுவது.

மடைமாற்றம்

இயல்பு ஊக்கத்தின் வழியாக ஏற்படும் மனவெழுச்சிகளையும் ஊக்கிகளையும் சமூகத்தால் ஒப்புக்கொள்ளக்கூடிய வகையில் நிறைவேற்றிக் கொள்ள வழியில்லாத சூழ்நிலைகளில்

மனஇறுக்கமும் மனமுறிவும் ஏற்படுத்திக் கொள்வதற்குப்பதில் அவ்வூக்கிகள் அனைத்தையும் சமூகம் ஏற்றுக்கொள்ளக்கூடிய ஊயர்நிலை ஊக்கிகளாக மாற்றுதலே 'மடைமாற்றம்' எனப்படும்.

"உயர்வழிப்படுத்தலுக்கு 'மடைமாற்றம்' எனகிற உளச்செயல் முக்கிய அங்கம் வகிக்கிறது" என்கிறார் ஃப்ராய்ட்.

உதாரணம்

- ✓ இயல்பாகக் காணப்படும் பாலுணர்வைச் சமூகம் ஏற்றுக் கொள்வதில்லை. அவற்றை சமூகம் ஏற்றுக்கொள்ளும் வகையில் கவிதை இயற்றுதல், சிற்பம் வடித்தல், ஓவியம் வரைதல் போன்ற ஆக்கபூர்வமான கலைகளில் திசை திருப்பிவிடுதல்.
- ✓ குழந்தைப் பேறு இல்லாதவர்கள் செல்ல விலங்குகளை வளர்த்தல்.

பின்வாங்கள்

மனமுறிவு அல்லது தோல்வியை உண்டுபண்ணும் சூழ்நிலையிலிருந்து ஒருவன் விலகிக்கொள்ளும் முறையைப் பின்வாங்குதல் என்று கூறுகிறோம். இக்கட்டான சூழ்நிலையிலிருந்து பின்வாங்கிக்கொள்ளுவதால் தாமே பாதுகாப்பைத் தேடிக்கொள்கின்றனர். தோல்வியை ஏற்றுக்கொள்ள முடியாத மனநிலை உடையவர்கள் பின்வாங்குகின்றனர்.

முதலில் கடினமான செயல்களில் பின்வாங்குதல் நிகழ்கிறது. அது தொடர்ந்து நிகழும் போது எளிமையான செயலைக் கூட நம்மால் செய்ய முடியாத மனநிலை ஏற்பட்டுப் பின்வாங்கும் சூழ்நிலைக்குத் தள்ளப்படுகிறது.

உதாரணம்

- ✓ மலை மீது ஏற முடியாத ஒருவன் தோல்வியடைவதை விரும்பாதவன் ஏறுவதைத் தவிர்க்கின்றான். நான் சென்றிருந்தால் மலை மீது ஏறியிருப்பேன் என்று கூறுவது.
- ✓ தன்னால் ஒரு செயலை முழுமையாகச் செய்து முடிக்க முடியாது என்று அறிந்த ஒருவன் பின்வாங்குவான்.

முடிவாக

செயலில் ஈடுபடாமல் அதிலிருந்து விலகிநிற்கும் செயலே தற்காப்பு நடத்தையாகும். இதன் விழைவு நம்மை நாமே ஏமாற்றிக் கொள்ளும் முயற்சியே ஆகும்.

மனப்போராட்டங்களால் ஏழக்கூடிய மனஇறுக்கம், மனமுறிவு ஆகியவற்றைத் தவிர்க்க பல உத்திகளைக் கையாள்கின்றோம்.

நனவுமனம் யாரை அதிகமாக விரும்புகின்றதோ (குறிப்பாகப் பெற்றோர், உறவினர், ஆசிரியர், தலைவர், நடிகர்) அவர்களை உயர்வாக எண்ணி உறவு கொள்ளவைக்கிறது. அன்பு, பற்று, நட்பு, மரியாதை, பணிவு ஆகிய அனைத்தும் நனவுமனத்தின் வெளிப்பாடுகளாகும். நெறிவயமாக்கப்பட்ட வெளிப்பாடுகளின் வழியில் பாலுணர்ச்சியை நனவுமனம் வெளிப்படுத்துவதன் வழியில் அகஇறுக்கம் குறைகிறது.

கவலை, அவமானம் குற்றவுணர்ச்சி போன்றவற்றிலிருந்து ஒருவனைப் பாதுகாக்கின்றன தற்காப்பு நடத்தைகள். ஒருவனை இக்கட்டான சூழ்நிலைகளிலிருந்து விடுவித்து அவனது சுயகௌரவம் பாதிக்கப்படாமல் இருப்பதற்கு இவை உதவிகின்றன. கடுமையான மனஇறுக்கத்தால் பாதிக்கப்பட்டு மனநோயாளியாக மாறுவதிலிருந்து தடுக்கிறது. எனவே, தற்காப்பு நடத்தையைக் குறைவாகப் பயன்படுத்தும் போது நமது செயல்பாடுகளில் நிறைவு அடைய முடியும். இல்லை எனில், அதிக அளவில் பயன்படுத்தம்போது அது நமது பொருத்தப்பாடற்ற நடத்தையையும் மனநோயையும் உண்டாக்குகின்றன. தற்காப்பு நடத்தையைக் குறைத்துக் கொள்ளும் போது உடல், மனம் சமநிலை அடையும்.

A STUDY ON LIFE COPING SKILLS AMONG HIGH SCHOOL STUDENTS

Ms. J. Lizzie, Dr. D. Hemalatha Kalaimathi

Abstract

The ultimate aim of Education is the overall development of a child's personality which cannot be achieved without exposing students to various Life Coping Skills. Life Coping Skills are the abilities that help in the promotion of mental and social well being and competence in young children to face the realities of life. Hence, Life Skills Education plays a key role in the growing years. Activities designed to strengthen Thinking Skills, Social Skills, Personal Self-Management Skills and Emotional Skills will help learners to be actively engaged in school. Enhancing the social environment with Life Coping Skills empowerment of students can increase school bonding, which in turn may enhance academic achievement and reduce problem behaviour. The present paper briefly describes the Life Coping Skills among high school students. The sample for the study composed of 300 high school students selected randomly from The Government, The Government Aided and The Private high school Students of Tiruvallur city. The investigator has used descriptive survey method. Descriptive analysis and inferential analysis had been utilized for this study. Null hypotheses were framed and tested by the researcher. To assess the Life Coping Skills a questionnaire was constructed by the investigator. The investigator found there is significant difference in their Life Coping Skills based on Gender, Locality and Medium of Instruction.

Keywords

Life coping skills.

Introduction

There are many different understandings of life skills but no definition is universally accepted. Different organizations attach different meanings to the term. **The International Bureau**

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of Education (IBE) derives "its understanding from the Delors four pillars of learning - learning to know, learning to do, learning to be and learning to live together - and defines life skills as personal management and social skills which are necessary for adequate functioning on an independent basis."**UNICEF** has defined Life Coping Skills as " a behavior change or behavior development approach to address a balance of three areas; knowledge, attitude, and skills." There are so many situations in our lives that cause worry. Life seems to be really difficult. This is due to the fact that somewhere we lack the essential skills that are required to handle these difficult situations. This is where Life Skills come to our rescue. Life Coping Skills helps us to regulate our lives. They contribute to our perceptions of self confidence and Self-Esteem as well as motivate us to look after ourselves and others, handle day to day situations effectively, and prevent any health and behaviour problems. These skills are interrelated. When we try to work out a difficult situation, we always use more than one Life Coping Skills. Life skills help adolescents to transit successfully from childhood to adulthood by healthy development of social and emotional skills.

Needs of Life Coping Skills

Anyone who wants to lead a meaningful life, needs Life Coping Skills. Life Coping Skills are applicable to all ages of children and adolescents, since young people in there age group seem to be the most vulnerable to behaviour related health problems. Life Skills are thus needed for the promotion of good health and well being, rather than they are used as an intervention aimed only at those already at risk.The host of factors that promote high risk behaviour such as alcoholism, drug abuse and casual relationships are boredom, rebellion, disorientation, peer pressure and curiosity. The psychological push factors such as the inability to tackle emotional pain, conflicts, frustrations and anxieties about the future are often the driving force for high risk behaviour. Life Coping skills training is an efficacious tool for empowering the youth to act responsibly, take initiative and take control. It is based on the assumption that when young people are able to rise above emotional impasses arising from daily conflicts, entangled relationships and peer pressure, they are less likely to resort to anti social or high risk behaviours.

Rationale

Life Coping Skills enhances, self awareness, decision making, critical thinking, creative thinking, problem solving. Self Awareness of our uniqueness is very important for positive self-esteem. People are supposed to be the way they are. It is very important for us to understand our true worth. We should value ourselves and only then others will value us. Self Awareness teaches us who we are and our place in the world. It helps us to gain the confidence needed to succeed in

our academic, social and professional life. In our everyday life, all of us do a lot of thinking. Thinking is a conscious act and takes time. Thinking skills are essential to make us sail through difficult situations. They are simple or lower level thinking skills like learning and memorizing facts; and higher order thinking skills like creative and critical thinking, analysis, problem solving, and so on. Life Coping Skills affect day-to-day life as well as the Academic Achievement of the students. students have to improve their Life Coping Skills.

Theoretical Background of the present study

Furlonger., Brett., Gencic., Emilia., (June 2014) Distance education students are confronted with a range of additional challenges as part of their tertiary study experience. A quantitative approach was used to identify the challenges they face, their relative levels of satisfaction, coping strategies, and academic performance. Two hundred and ninety-five students (64 male and 231 female) participated by completing a survey that included measures of satisfaction, stress, coping, and academic performance. All were enrolled in an Australian university and studied either on campus or in one of the two distance education (DE) modes, off-campus and offshore. While there were some differences in satisfaction expressed between DE and on-campus students, there were no significant differences among the groups on measures of stress or academic performance. The differences among the three groups' use of coping strategies were not clear. Possible explanations for the differences among the groups are discussed.

Objectives of the Study

1. To find out the level of Life Coping Skills among High School Students .
2. To find out whether there is any significant difference in the Life Coping Skills among the High School Students based on
    a. Gender
    b. Locality
    c. Medium of Instruction
    d. Type of family

Hypotheses of the Study

1. The level of Life Coping Skills among High School Students is moderate.
2. There is no significant difference in the Life Coping Skills among High School Students based on

a. Gender
b. Locality
c. Medium of Instruction
d. Type of family

Tool Used

Life coping skill questionnaire

Sample and Method of the Study

A sample of 300 High School Students were taken at random from four different schools. In the present study normative survey method was employed. The Normative method is used to describe and interpret, what exist at present. Data are gathered, tabulated, classified, interpreted, compared, evaluated and then generalizations are made.

Statistical Used

- Descriptive analysis (Mean, SD & Mean percentage)
- Differential analysis (t-test)

Descriptive Analysis

The level of Life Coping Skills among High School Students is moderate.

Categories	Range	Frequency	Percentage
Low	40-88	83	27.66%
Moderate	89-99	134	44.67%
High	100-120	83	27.66%
Total		300	100%

It is observed that more number of students lie in the moderate category showing that the level of Life Coping Skills of High School Students is moderate as hypothesised.

Differential Analysis

There is no significant difference in the Life Coping Skills among high school students based on Gender, Locality, Medium and Type of Family.

Sub Samples	Group	N	Mean	SD	t value	LS
Gender	Male	150	92.14	8.44	2.89	0.01
	Female	150	94.93	8.34		
Locality	Rural	196	92.77	8.33	2.15	0.05
	Urban	104	94.99	8.63		
Medium	English	150	94.43	7.97	1.99	0.05
	Tamil	150	92.65	8.92		
Type of Family	Joint	74	92.24	8.49	1.51	NS
	Nuclear	226	93.96	8.47		

It is observed that the Mean score for the Life Coping Skills was high (94.93) for female and the same was low (92.14) for male students. The 't' value calculated revealed that the female and male students differ significantly with each other in their Life Coping Skills.

The mean score for the Life Coping Skills was high (94.99) for students from Urban and the same was low (92.77) for Rural students. The calculated 't' value shows that the Rural and Urban students differ significantly with each other in their Life Coping Skills.

The mean score on Life Coping Skills of IX standard students studying in English medium was high (94.43) and the same was low (92.65) for the students studying in Tamil medium. The 't' value calculated revealed that the students studying in English medium differ significantly with those studying in Tamil medium at 0.05 level in their Life Coping Skills.

The mean score of Life Coping Skills of IX standard students was high (93.96) for students from nuclear family and the same was low (92.24) for students from joint family. The t-value calculated revealed that the students from joint and nuclear family do not differ significantly with each other in their Life Coping Skills.

Findings

- ✓ The level of Life Coping Skills among High School Students is moderate.
- ✓ There is significant difference in their Life Coping Skills among High School Students based on Gender. The Female Students have better Life Coping Skills than the Male Students.
- ✓ There is significant difference in the Life Coping Skills among High School Students based on Medium of Instruction. The English medium Students have better Life Coping Skills than the Tamil medium Students.
- ✓ There is significant difference in the Life Coping Skills among High School Students based on Locality. The Urban Students have better Life Coping Skills than the Rural Students.
- ✓ There is no significant difference in the Life Coping Skills among High School Students based on Type of Family.

Educational Implication

This investigation generalizes that Life Coping Skills help in regulating our lives. Life Coping Skills enhance self-confidence and self-esteem among students. Life skills help adolescents to transit successfully from childhood to adulthood by healthy development of social and emotional skills. Peer Educators trained by counselors of schools can present an effective resource for mentoring students as Peer interaction is the most successful form of transaction of Life Coping Skills.

a. Through counseling, training programmes.

b. By inculcating Yoga and Meditation

c. By incorporating Life Coping Skills based education in the present system of Education.

Conclusion

Life Coping Skills Development is a life-long process that helps individuals grow and mature; build confidence in their decisions taken on the basis of adequate information and thought, and discover sources of strength within and outside. It is noteworthy that from times immemorial, every culture and society has invested in educating and empowering its younger generation to lead fulfilling and responsible lives. The Life Coping Skills Program can be effectively provided to young adolescents by teachers, peer educators, parents, counselors, psychologists, health workers

and social workers. The role of teachers and facilitators in developing Life Skills differs from traditional instruction in their being a guide and friend to facilitate learning.

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E - LEARNING: AN EMERGING MEGATREND

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Abstract

E-learning is an emerging innovative learning programme in which a student learns at least in part through online delivery of content and instruction with some element of student control over time, place, path or pace. While still attending a 'brick and mortar' school structure, face-to-face classroom methods are combined with computer-mediated activities. Now-a-days e-learning is being increasingly combined with traditional classroom methods and independent study to create a new, hybrid teaching methodology. It represents a much greater change in basic technique than simply adding computers to classrooms. It represents, in many cases, a fundamental change in the way teachers and students approach the learning experience. This paper describes e-learning, distinguishes between e-learning and on-line learning, traces the growth of e-learning, focuses on the scope of and need for e-learning and enumerates the major types of e-learning besides providing guidelines to design e-learning.

Introduction

Electronic learning is a type of education where the medium of learning is computer technology. No inperson interaction may take place in some instances. E-learning is used interchangeably in a wide variety of contexts. In companies, it refers to the strategies that use the company network to deliver training courses to employees. In the USA, it is defined as a planned

Teaching/learning experience that uses a wide spectrum of technologies, mainly Internet or computer-based, to reach learners at a distance. Lately in most Universities, e-learning is used

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to define a specific mode to attend a course or programmes of study where the students rarely, if ever, attend face-to face for on-campus access to educational facilities, because they study online.

Definitions of e-Learning

Any technologically mediated learning using computers whether from a distance or in face-to-face classroom setting (computer assisted learning) is called e-learning. E-learning is the learning process created by interaction with digitally delivered content, services and support. E-learning refers to any electronically assisted instruction, but is most often associated with instruction offered via computer and the Internet. It includes delivery of content via all electronic media, including the internet, intranets, extranets, satellite, broadcast, video, interactive TV, and CD Rom (Pulichino,2005).The concept of e-learning encompasses all learning undertaken, whether formal or through electronic delivery. This is an approach to facilitate and enhance learning through the use of devices based on both computer and communication technology, including personal computers, CD-ROMs, digital television, and more. Many organizations consider it as a network enabled transfer of skills and knowledge (Brodsky, 2003). E-learning refers to the provision, administration and support for 'off-the-job' and the 'on-the-job' training using information and communication technologies such as stand-alone and networked computers, Internet-based technologies and mobile devices.

Technically speaking e-learning is the convergence of learning and the Internet-(Banc of America Securities, 1999). It refers to the use of network technology to design, deliver, select, administer, and extend learning-(Elliott Masie, 1999). According to Robert Peterson and Piper Jaffray (1999) e-learning refers to the use of various internet and web technologies to create, enable, deliver, and/ or facilitate lifelong learning.

Difference between e-Learning and Online Learning

Hambrecht (2000) identifies the differences between e-learning and online learning. E-learning represents the whole category of technology –based learning, while online learning is synonymous with web-based learning. In this case, online learning is actually a subset of e-learning. The term e-learning covers a wide set of applications, and processes, including computer-based learning, web-based learning, virtual classrooms, and digital collaboration**.** It is technology based learning. Online learning constitutes just one part of technology-based learning and describes learning via Internet, Intranet, and extranet. It is web based learning

Growth of e-Learning

By 2006, nearly 3.5 million students were participating in on-line learning at institutions of higher education in the United States. Many higher education, for-profit institutions, now offer on-line classes. By contrast, only about half of private, non-profit schools offer them. The Sloan report, based on a poll of academic leaders, says that students generally appear to be at least as satisfied with their on-line classes as they are with traditional ones. Private Institutions may become more involved with on-line presentations as the cost of instituting such a system is decreasing. Properly trained staff must also be hired to work with students on-line. These staff members must be able to not only understand the content area, but also be highly trained in the use of the computer and Internet. Online education is rapidly increasing, and online doctoral programmes have even developed at leading research universities.

As early as 1993,Graziadi, W. D. described an online computer-delivered lecture, tutorial and assessment project using electronic Mail, and Gopher/Lynx together with several software programmes that allowed students and instructor to create a Virtual Instructional Classroom Environment in Science(VICES) in Research, Education, Service& Teaching(REST). In 1997 Graziadei, W .D. et al., published an article entitled, *Building Asynchronous and Synchronous Teaching-learning Environments: Exploring a Course/Classroom Management System Solution strategy for technology-based learning.* They described a process at the State University of New York (SUNY) of evaluating products and developing an overall strategy for technology-based course development and management in teaching –learning. The product(s) had to be easy to use and maintain, portable, replicable, scalable, and immediately affordable, and they had to have a high probability of success with long-term cost-effectiveness. Today many technologies can be, and are, used in e-learning, from blogs to collaborative software, ePortfolios, and virtual classrooms. Most e-learning situations use combinations of these techniques.

Along with the terms learning technology, instructional technology, and Educational Technology, the term is generally used to refer to the use of technology in learning in a much broader sense than the computer-based training or Computer Aided Instruction of the 1980s.It is also broader than the terms Online Learning or Online Education which generally refer to purely web-based learning. In cases where mobile technologies are used, the term M-learning has become more common. E-learning, however, also has implications beyond just the technology and refers to the actual learning that takes place using these systems.

Emerging Megatrend

Six major trends or megatrends are affecting education according to Michael T.Moe, Kathleen Bailey, and Rhoda Lau in the Merrill Lynch report titled, *The Book of Knowledge-Investing in the Growing Educational and Training Industry.* The megatrends are occurring in demographics, technology, globalization, branding, consolidation/privatization, and outsourcing (Merrill Lynch, 1999). Teachers need deliberate and persistent effort to use new technologies for faster development and growth due to global competition in corporate sector in general and the teaching-learning process in particular. The 21st century is witnessing revolutionary impact of e-learning on the complementary two-way process of teaching learning in real classroom activities (Rameswari, and Ramar 2014).

Scope of e-Learning

E-learning is naturally suited to distance and flexible learning, but can also be used in conjunction with face-to face teaching, in which case the term Blended learning is commonly used .E-learning pioneer Bernard Luskin argues that the "E" must be understood to have broad meaning if e-learning is to be effective. Luskin says that the "e" should be interpreted to mean exciting, energetic, enthusiastic, emotional, extended, excellent, and educational in addition to "electronic" that is the traditional national interpretation. This broader interpretation allows for 21st Century applications and in higher education it brings learning and media psychology into the equation.

In higher education especially, the increasing tendency is to create a Virtual Learning Environment(VLE) (which is sometimes combined with a Management Information System(MIS) to create a Management Learning Environment) in which all aspects of a course are handled through a consistent user newer online-only colleges, have begun to offer a select set of academic degree and certificate programmes via the Internet at a wide range of levels and in a wide range of levels and in wide range of disciplines. While some programmes require students to attend some campus classes or orientations, many are delivered completely online. In addition, e-counselling, online textbook purchase, student governments and student newspapers have become practicable.

E-Learning can also refer to educational web sites such as those offering learning scenarios, worksheets and interactive exercise for children. The term is also used extensively in the business sector where it generally refers to cost-effective online training.

E-learning services have evolved since computers were first used in education. There is a trend to move toward blended learning services, where computer-based activities are integrated with practical or classroom-based situations.

E-learning lessons are generally designed to guide students through information or to help students perform in specific tasks. Information based e-learning content communicates information to the student. Examples include content that distributes the history or facts related to a service, company, or product. In information-based content, there is no specific skill to be learned. In performance-based content, the lessons build off a procedural skill in which the student is expected to increase proficiency.

Need for e-Learning

Cognition and conceptualization depend on a chain of events which begin with the learner's perception of stimulus, be the auditory, visual, tactile and olfactory. It is important that these initial learning experiences be accurate, dependable and understandable. Unless the learners' initial sensory impressions are accurate, it will be impossible for them to have reliable conceptualization and understandings. With the existing numerous kinds of electronic aids, carefully organised presentation of information through a variety of media should occupy the learner's conscious attention to living stimuli. This is what is precisely ensured by the e-learning strategy.

Types of e-Learning

There are various types of e-learning. They are

1. E-training
2. Blended learning
3. Virtual Classroom
4. Digital Campus
5. Distance Education
6. Web in class

These types can be classified into two broad categories as self paced e-learning and blended learning or facilitated learning.

Self-Paced e-Learning

Most corporate e-learning has traditionally been e-training-self-paced, individualized delivery using highly-designed, 'interactive' materials prepared by professional instructional designers and developers and delivered via LMS. There is no trainer in sight, and no team or group involved. In practice this form of e-learning has proven most effective for an important but quite

limited range of training goals- for compliance(eg occupational health and safety), for IT application training, for induction and for product knowledge.

The key limitation of self-paced delivery is that learning and assessment is restricted mostly to information recall, because of the typical individual assessment tools available in the LMS- multiple choice, drag-and-drop and true/false. This means the learning may not always result in improved performance (or competence), because this usually only comes from applying and confirming the knowledge in context with the people and tools we are working with. For example, we can get everything right on a quiz about fire extinguishers, but still freeze up when the fire alarm rings. If the post-training results we want involve licensing or accreditation, then we also need some sort of processes for demonstrating the level of performance reached.

Blended or Facilitated Learning

Driven by the need to bring performance-based learning and assessment to the online space, Australin training providers have developed facilitated e-learning approaches which are arguably as mature and effective as anywhere in the world. The facilitated approach offers lots of potential training benefits –higher motivation and completion rates, greater range of training outcomes, peer-to-peer learning gains, team or community building, plus up skilling in communication technologies as part of working and learning. Brad Beach, Manager of innovation and Organisational Development at Gipps TAFE suggests your consideration to decide which way to go for a given e-learning initiative. They are learner readiness, available content, delivery skills and marketing.

How to Design e-Learning?

With the paradigm shift in education, many educators, developers, and educational publishers are stepping into eLearning domain. But most newbies are unaware of the intricacies in building an effective interactive learning courseware. There are four stages involved in the development of educational courseware.

Four Phases in the Development of eLearning Course

There are four vital phases in the development of e-learning course which should be followed meticulously. They are discussed below:

Analysing / Concept Phase

This is the conceptualizaion stage of an eLearning course. During this stage, the framework

and objectives are created through detailed research. The concept document lays the foundation for outline, purpose and intent of the project. It includes:

- Assessing current demand for this course
- Defining the target audience (demographics)
- Describing, Outline of the course
- Listing of multimedia tools used in the course
- Finalizing flow of course content
- Considering the budget
- Fixing timetable for each task

Designing Phase

In the designing phase, in-depth study on the course content, course navigational structure, approach and graphic design are developed. The sample graphics, design layouts and software requirements are specified. The following are carried out in the design phase.

- Creating detailed storyboard (text, graphics, multimedia, programming, etc.) for each page
- Creating the first draft of the eLearning course (it includes navigation elements, design prototype)
- Establishing course flow with a course management plan
- Preparing briefs for standards
- Editing the eLearning model(editing)

Production Phase

The content and technical issues are developed, integrated and finalised

- Modules for the course are created
- Flash, graphics, multimedia elements and programming are completed.
- First stage of testing is conducted

Delivery Phase

The eLearning course is uploaded and final round of verification is done:

- ❖ Proofreading of course content
- ❖ Content quality review is made and verified
- ❖ Browser compatibility test, link testing and rendering of graphics in different devices are carried out
- ❖ Quality assurance checks are done

On completion of all these procedures the eLearning course can be used for the benefit of wider population.

Conclusion

With good design and delivery, e-learning gives people and organization the competitive edge to allow them to keep ahead or, at least, abreast of the rapidly changing global economy. It is a highway whatever you may call it which leads us to the fresh avenues of measureless information. Unless we cope with the changing scenario, it will not be long before we are left too far behind to meet the challenges ahead.

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"MAKING REAL REALISTIC" IN CHETAN BHAGAT'S FICTION

Dr. R. Shanthi

Abstract

The success of Chetan Bhagat lies mainly in portraying how individuals overcome the nightmares of real life. Based on real events, his fiction ensures that an individual can succeed despite internal and external calamities. Realism, in literature, is an approach that attempts to describe life without idealization or romantic subjectivity. Realism has been chiefly concerned with the commonplaces of everyday life among the middle and lower classes, where character is a product of social factors and environment. It is an approach that proceeds from an analysis of reality in terms of natural forces.

Chetan Bhagat presents the struggle for relationships, both at personal and social levels. He depicts the practical learning of extending relationships. Replacing the four kinds of realism: social description, social formula, personal description and personal formula, his novels belong to the new kind as suggested by Raymond Williams in "Realism and the Contemporary Novel":

The realist novel needs, obviously a genuine community of persons

linked not merely by one kind of relationship – Work

or friendship or family – but many, interlocking kinds.

The recorded life of individuals signifies common human life. The connective link is relatively linked to groups - permanent and continuous. In all his novels, Bhagat's concern for society and nation is at large. In portraying the modern social reality of life, he has few peers in the contemporary literary scenario. In presenting real events and reality of life, he follows deliberate selection and concentration and hence it becomes valuable and significant. The significant experiences are excitingly explored and hence more appealing and realistic in tone.

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As *New York Times* has put it, Chetan Bhagat is "the biggest–selling, English language novelist in India's History". Chetan Bhagat's success lies mainly in effective portrayal of individuals overcoming the nightmares of real life. Based on real life incidents and events, his fiction ensures that an individual can succeed despite internal and external calamities. As commented in the cover page: "Seen more as the voice of a generation than just an author, Chetan Bhagat, this IIT/ IIM – A graduate is making India read like never before".

With a commendable creative effort, Chetan Bhagat presents the struggle for relationships, both at personal and social levels. He implicitly depicts the practical learning of extending relationships. Replacing the four kinds of realism: social description, social formula, personal description and personal formula, his fiction belongs to the new kind as suggested by Raymond Williams in "Realism and the Contemporary Novel":

The realist novel needs, obviously a genuine community, a community of persons linked not merely by one kind of relationship - Work or friendship or family - but many, interlocking kinds. (589)

In Chetan Bhagat, the world is actualized as lived by individuals, but not as narrated by one man.

In his maiden blockbuster novel, released as a major film, *Five Point Someone: What not to do at IIT***,** Bhagat actualizes life through three individuals, Hari Kumar, Ryan Oberoi and Alok Gupta. Though he presents three ways of seeing three worlds, yet the three is composed into one world.

As Chetan Bhagat asserts, this novel is "not a guide on how to live through college. On the contrary, it is probably an example of how screwed up your college years can get if you don't think straight." (1) But he fails not to hit at an educational system that treats humans like mindless machines. Venkat had a good GPA and everything, but he was hardly human: "Nobody in Kumaon talked to Venkat; given a choice he wouldn't talk to himself."(65)

Bhagat also portrays professors like Veera who doesn't "discriminate between 9-pointers and 5-pointers. And he likes original thinking. Even his assignments make you think more." (89) He invites ideas and identifies the research aptitude in Ryan, who is considered an under-performer and encourages him to do lube project. When Ryan, the last in the college, did not get placed in the campus interview, he offers to work as his RA on a lubricant project.

People die to get into IIT. Professor Cherian's son, Samir commits suicide since he failed

thrice in the entrance. The three bright toppers in school face the screwed up unfair educational system at collegiate level with 6 courses, 4 of them with practical classes, lectures, tutorials and labs, a few hours in the library, preparing reports and finished assignments, 42 tests per semester, one major and three Surprise Quizzes demanding them mug up in class and puke in tests.

Ryan, Hari and Alok plan to "Cooperate to Dominate". They are against the system because

i. it suppresses talent and individual spirit.

ii. it extracts the best years of one's life from the country's brightest minds.

iii. it judges with a draconian GPA system that destroys relationships. (107-108)

They also feel that IIT's contribution to the country is nothing. Bhagat suggests a change in the outlook of the professors. Professor Cherian's convocational address solves the problem:

> All of you should be proud to have the IIT tag; but never ever judge anyone who is not from this institute – that alone defines the greatness of this institute. (261)

Rather than conquering the world as an IITian, it is essential to conquer one's self with good friends.

He portrays the three friends as happy "with low expectations of one's self." (116) But the subtitle *What not to do at IIT* strikes at a compromise between hard work and fun, mugging and doing more projects. As Alok puts it "if you do well, the world is your oyster." (11) Though "this is a work of fiction" Bhagat stresses more in the Acknowledgements on the need for "real inspiration."

In his second novel, *One Night @ the Call Center* as Bhagat puts it in the Prologue, he moves from the IITians who face challenges to hundreds and thousands of other youths. He selects, as suggested by the beautiful lady, the Call Centers, the Business Process Outsourcing Centers (BPOS) as the centre of his story. In BPOS around 3 lakh people work helping the US companies in the sales, services and maintenance of their operations. Usually younger people work there in night shift.

The story is about six people, Shyam, Mehra, Military Uncle, Priyanka, Radhika, Esha and Vroom all working in Connexions Call Center, set in one night. It was the night they got a phone call from God. Through six individuals with their boss, Bakshi, Bhagat actualizes reality and that too the composite reality of the present day world.

Bhagat presents the problems of lovers, husband-wife, individual as well as conflicts in family and business circle. All the six together face the same crisis though individually they have their personal worries and conflicts.

By portraying the life of characters – Shyam Mehra, Military Uncle, Varun Malhotra or Vroom as he called, Priyanka, Radhika, Esha – all working in the bay – Chetan Bhagat actualizes reality and that too the composite reality of present day youth and India.

They have different names, speak in a different accent, monitor problems and strange error messages and being monitored on average call handling times with a biased boss, a parasite, playing politics with other managers. At present, there are no new orders, call volumes at an all time low– Connexions is doomed. Rumours are there that the center would collapse.

The youth work there just for the 15 days a month to maintain life style with Pizza Hunts and Cokes and Pepsis. In the center they have to "be nice, be polite, be helpful." The call center jobs do not make them work to their potential. As Vroom comments dejectedly:

Our government doesn't realize this, but Americans are using us, we are sacrificing an entire generation to service their call centers. (207)

Any job should make one work to one's benefits. In addition when it helps to build something for the country, for its future, the individual attains job satisfaction. Otherwise, as Vroom rightly puts it;

> An air conditioned sweet shop is still a sweetshop. In fact, it is worse, because nobody sees the sweat. Nobody sees your brain getting rammed. (208)

With dissatisfaction in corporate life, they suffer from personal worries. The love between Shyam and Priyanka depends on financial prosperity; Shyam does not realize his potentialities and strongly believes that he is not good for anything. Vroom does not use his skill till the end. He is very casual about things and wastes life in youth culture. Radhika, though works for the family, day and night, she is cheated by her husband and her mother-in-law always complains of her service. Esha is ready to make compromises on her morals to become a model. She struggles hard because she is not an inch taller for the purpose. Military Uncle as he is called, with his outdated values walked out of his son's house at the U.S. to work with an inflated ego, without expression and more resigned on all issues.

With a pent up mood everyone wanted to get out of his or her miseries, if only for a few

moments. At 3 a.m. they plan to go for a drive. On their return, they drove into a pit and the Qualis is trapped, suspended by rods. They felt the end was near. There was no hope in life– literally and figuratively.

At that crucial moment, they get a phone call from God, of course the mobile rings without a network. God breaks the check and impresses them.

As Chetan Bhagat puts it, "One has to present reality in a story." So he asks the lady in the compartment to give a rational, scientific explanation of the God's call. The rational, scientific youth can take it as the 'inner voice', the most important call in the world.

> ….the little voice inside that wants to talk to you. But you can only hear it when you are at peace – and then too it is hard to hear it. Because in modern life, the networks are too busy. The voice tells you what you really want….. (227)

It is certainly the inner call, God's call, because it brings out an immediate change in all. Vroom comes to an immediate realization:

> That I should not have taken up a job just for money ….. But jobs that pay less could be better. There could be jobs that define me, make me learn or help my country. I justified it by saying money is progress. But it is not true. Progress is building something for the future. (228)

God makes a deal with them. He will save their life but in turn, they must think what they really want and what they need to change in their life to get it. God's deal is only for the prosperity of man. Next is left to man, to act on those changes.

God has opened their eyes and everyone's face was a lot calmer. Vroom decides to live a meaningful life quitting the job at Call Center. Prinyanka realizes her need for Shyam's love and later decides to marry him. Military Uncle realizes his mistakes and decides to join his sons at the U.S. Radhika decides to divorce her husband Anuj, and be herself again, as she was before marriage. Esha decides to find a better use for her books, if they are worth anything. She cancels her long nourished dream to become a dumb model. Shyam wants to become successful. All have poured out their deepest secrets to God. God is amazed and pleased because,

> Knowing what you want is already a God start. (231)

God suggests four ingredients for success in life to Shyam, which is important for everyone as well. They are intelligence, imagination, self-confidence and face failure courageously. God is

really great for he made them realize that they are people, not resources. As directed by God, they start getting solution for the real issues of the call centres by thinking of their weak spots to win. By the miracle of God, there comes a great change in all of them and they take corrective measures immediately. They realize:

> It is time to face the real world, even if it is harder and painful. I am tired of soft, comfortable options. It is time to face the real world, even if it is harder and painful. I'd rather fly and crash, than just struggle and sleep. (239)

They make five minutes call to scare the Americans into calling regularly by telling them that terrorists have hit America with a new computer virus that will take their country down. All turn a new leaf, as they wished.

In his third novel, *The 3 Mistakes of My Life: A Story about Business, Cricket and Religion,* he narrates the passion of three friends. In realizing their goals, they fall into religious, political disturbances, unacceptable love and above all their own mistakes. His message is that man, with his proneness to mistakes, can succeed in life, if he persistently takes efforts.

With real bravado and sincerity, he interestingly narrates his personal life, especially his personal struggle to win the hand of his lady love in *Two States*. In the Indian context, he brings out vividly, that marriage is not merely between a man and a woman but between two families and in his case it is between two states, he being a Punjabi, his beloved, a Tamil. The lively description portrays carefully and subtly selected personal events. The continuity of method and substance, the young lovers struggle and their steadfastness reflects the varied aspects of the society.

In his fifth novel *Revolution 2020,* Chetan Bhagat making his personal appearance, passes an important verdict on "Goodness". He portrays the editor of Revolution 2020 as living for society and nation. But at the same, he rethinks and considers Gopal, the Director of Ganga Institute of Engineering & Technology also as good. It is because he is worried about conscience and takes corrective measures. Above all, he sacrifices his love. As in other novels, Bhagat's concern for society and nation at large is seen.

Chetan Bhagat is aptly called the "Charles Dickens of India". In portraying the modern social reality of life, he has few peers, in the contemporary literary scenario. His realistic tradition is in a new form, altered in technique but continuous in experience. In presenting real events and reality of life, he follows deliberate selection and concentration and hence it becomes valuable and significant. The significant experiences are excitingly explored and hence more appealing and realistic in tone.

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எண் கணிதம்

முனைவர் ஆர். நிர்மலா தேவி

கணிதம் என்பது அறிவினுடைய வளர்ச்சியில் அமைந்த முக்கியமான பகுதி. இது 'அறிவியலின் அரசி' என்று மேனாட்டவரால் போற்றப்படுகிறது. தமிழ்நாட்டில் கணிதப் பயாறிசி தொண்று தெர்ட்«த்தின் ஆட்சி ஏறத்தாழ 3000 ஆட்டுகளுக்கு முன்பிருந்தே நடந்ததை,

'உயிரும் புள்ளியும் இறுதி யாகி

அளவும் நிறையும் எண்ணும் சுட்டி

உளவெனப் பட்ட எல்லாச் சொல்லும்'(தொல்.எழுத்து.தொகை.22)

என்று 2600 ஆண்டுகளுக்கு முன்பு தோன்றிய தொல்காப்பியம் தன் நூற்பாவில் எண்ணைப் பற்றிக் குறிப்பிடுகிறது. திருவள்ளுவர் இலக்கியத்தைவிடக் கணிதத்திற்கே சிறப்பிடம் தந்ததை

''எண்ணென்ப ஏனை எழுத்தென்ப இவ்விரண்டும்

கண்ணென்ப வாழும் உயிர்க்கு''

என்ற குறளால் அறியலாம். எண் என்று சொல்லப்படுவனவும், எழுத்து என்று சொல்லப்படுவனவும் ஆகிய இவ்விரண்டு கலைகளும் மனிதர்களுக்குக் கண் போன்றது என்பது வள்ளுவர் வாய்மொழி. கணக்கு, கணிதம் என்ற இரு சொற்களிலும் முதற்பகுதி கண் என்ற சொல்லின் உச்சரிப்பை ஒட்டியதாகவே இருப்பது சிந்திக்கத்தக்கது. எண்ணுமெழுத்துங் கண்ணெனத் தகும் (கொன்றை வேந்தன்), எண்ணெழுத் திகழேல் என்ற மூதுரைகள் எண்ணின் சிறப்பினைக் கூறுகின்றன. அக்காலத்தில் எழுத்துக்கு முக்கியத்துவம் கொடுக்காமல் எண்ணுக்கு முக்கியத்துவம் கொடுத்ததால் தான் எண்ணும் எழுத்தும் கலந்து எழுத்தாணியால் தீட்டிப் பள்ளிப் பிள்ளைகள் கற்பதற்கு முதலில் கொண்டு செல்லும் பனையோலைக் கட்டுக்கு எழுத்துச் சுவடி என்று பெயர் வைக்காமல் எண்சுவடி எனப் பெயர் வைத்தனர். எழுத்து

உதவிப் பேராசிரியர் மற்றும் தலைவர் தமிழ்த்துறை, வேளாளர் மகளிர் கல்லூரி (தன்னாட்சி), ஈரோடு - 638 012

அலைபேசி - 99943 67069 மின்னஞ்சல் - prnirmaladevi@gmail.com

முதலியவற்றை எண்ணுவதற்கும், பொருள்கள் எவற்றையும் கூட்டுவதற்கும், குறைப்பதற்கும் எண் பயிற்சி இன்றியமையாதது. உலகத்திலுள்ள கலைகள் பலவற்றிலும் தலைமை பெற்று விளங்குவது எண்ணும் எழுத்துமே என்பதும் அவற்றில் முதன்மையுடையது எண் என்பதும் அனைவரும் அறிந்த ஒன்றே.

ஔவையார் அவர்கள் கம்பரை, 'எட்டேகால் லட்சணமே' எனத் தொடங்கும் வசைப் பாடலில்

'எட்டேகால் லட்சணமே எமனேறும் பரியே

மட்டிப் பெரியம்மை வாகனமே – முட்டமேல்

கூரையில்லா வீடே குலராமன் தூதுனே

ஆரையடா சொன்னாய் அது' (தனிப்பாடல் திரட்டு. ப.23)

எட்டு என்பது 'அ'என்ற தமிழ் எண் குறியீட்டைக் கொண்டது என்றும், 'கால்' என்பது 'வ' என்ற தமிழ் எண் குறியீட்டைக் கொண்டது என்றும் பொருள் கொண்டால் எட்டே கால் லட்சணமே என்ற சொல் அவலட்சணமே என்று பொருள்படும்படி சொல் விளையாட்டில் பாடல் புனைந்துள்ளார். இதன் மூலமாக தமிழ் எண்களில் எட்டு, கால் ஆகிய இரண்டு எண்களின் குறியீட்டு வடிவைத் தெரிந்து கொள்ள முடிகிறது. திருஅருட்பாவில் நடராச அலங்காரத்தில் 'இரண்டே காற்கை முகம் கொண்டீர்" என்ற பாடலடிகள் எண்களின் வடிவமைப்பைக் கொண்டுள்ளது. தமிழில் இரண்டு என்பது 'உ' எனவும் கால் என்பது 'வ' எனவும் கொண்டால் 'இரண்டே காற்கை முகம் கொண்டீர்" என்ற வரிக்கு 'உவகை முகம் கொண்டீர்' என்று பொருள்படும். இதனையே கலைக்கோட்டு மகரிஷி, வள்ளலார், புலத்தியர் போன்ற சித்தர்கள் எட்டும், இரண்டும் எனக் குறிக்கும் வழக்கமிருந்ததை,

'எட்டும் இரண்டும் ஒன்றாய்க் கூட்டி

ஓத சோதி காணும்" - கலைக்கோட்டு மகரிஷி

'எட்டோடே இரண்டு சேர்த் தெண்ணவு மறியீர்

எத்துணை கொள்கின்றீர் பித்துல கீரே'- திருவருட்பா, ஆறாம் திருமறை

'உரைத்ததால் புலத்தியனே உனக்குச் சொன்னேன்

உண்மையுடன் எட்டுரெண்டு மென்ற வார்த்தை' – புலத்தியர் கற்பம் 300

எண்களுள் மிக முக்கியமானது '0'- வாகும். இது பாழ் என்றும் கூறப்படும். இருக்க வேண்டிய ஒன்று அங்கு இல்லை என்பதைப் பாழ் என்ற சொல் உணர்த்தும். தலைவன் வருகையைக்

குறித்துத் தலைவி கண்ணை மூடிக் கொண்டு வரைந்த வட்டத்திலிருந்து சுழி என்பது தோன்றிருக்கலாம். இதைக் கண்டுபிடித்த பின்னரே எண்ணியலும், கணிதவியலும் வேகமாக வளர்ச்சியடைந்தது. இதனைக் கண்டுபிடித்து உலகிற்கு வழங்கியவர் இந்தியர்களே. பூஜ்ஜியத்தின் வேர்ச் சொல் சுழி – சுழிப்பு – வட்டமாகச் சுழிப்பது சுழி – சுழல் என்று மாறியது- சுழிப்பு - சைப்பு – சை.ஃபர் - Zephirium - Sifr/or Cipher - Zero - என்று மாறியது – என்பது திரு. இரா. கிருஷ்ணனின் கூற்று (தமிழே முதன்மொழி ப.11). தமிழில் சொல்லளவில் மட்டுமே பூஜ்ஜியத்தைப் பயன்படுத்தினர் நம் முன்னோர்.

பழந்தமிழர்கள் ஒரு நாளை வைகறை, விடியல், நண்பகல், ஏற்பாடு, மாலை, யாமம் என ஒவ்வொன்றும் பத்து நாழிகையுடையனவாகப் பிரித்திருந்ததைத் தொல்காப்பியத்திலும் குறுந்தொகையிலும் காணலாம். ஓர் ஆண்டை ஆறு பருவங்களாகத் தமிழர்கள் பெரும் பொழுதாகப் பிரித்துள்ளார் தொல்காப்பியர். அவற்றை கார், கூதிர் முன்பனி, பின்பனி, இளவேனில், முதுவேனில் எனக் கணித்திருந்தனர். சோழவள நாட்டில் உள்ள கொறுக்கையூர் காரிநாயனார் அறிவுடனும், நகைச்சுவையுடனும் எழுதப்பட்ட நூல் கணக்கதிகாரம். அதில் யுகத்தைப் பற்றி,

‘இருநூற் றொருபதுடன் ஆறாயிரத்தை

இருநால் இருமூன்றின் நாலில் - நிருமித்த

பின்னிரண்டு தன்னில் பெருக்கி திருமாதே

நண்ணுமொரு நாலுகத்தின் சீர்” (கணக்கதிகாரம்)

யுகத்தினை கிரேதயுகம், திரோதயுகம், துவாரயுகம், கலியுகம் என்று நான்காகப் பகுத்து ஒவ்வொரு யுகமும் எவ்வளவு காலளவு என்பதையும் துல்லியமாகக் கணக்கிட்டுள்ளனர். இருநூற்று பதினாறாயிரத்தை எட்டால் பெருக்க கிரேதயுகமும் (பதினேழு இலட்சத்து இருபத்தொண்ணாயிரம்), ஆறால் பெருக்க திரோதயுகமும் (பன்னிரண்டு இலட்சத்து தொண்ணூற்று ஆறு), நான்கால் பெருக்க துவாரயுகமும் (எட்டு இலட்சத்து அறுபத்து நான்காயிரம்), இரண்டினால் பெருக்க கலியுகம் (நான்கு இலட்சத்து முப்பத்திரண்டாயிரம்) என்றும் இந்த நான்கின் கூட்டுத்தொகை சதுரயுகம் (நாற்பத்தி மூன்று இலட்சத்து இருபதாயிரம்) என்றும் கணக்கிட்டு கூறியுள்ளமை வியப்பிற்குரியது.

கைநொடி, மாத்திரை, குரு, உயிர், கூணிகம், சூஷ்பிறம், சூட்சணம், கனம், காட்டை, மொட்டை, துடி, வினாடிகை, சாமம், பொழுது, நாள், திங்கள், ஆண்டு, யுகம் ஆகியவைச் சுவடிகளில் குறிக்கப்பட்டுள்ள கால அளவைகள். அளவைக் காட்டும் குறியீட்டு கணக்கீட்டு அளவில் துடி என்பது மிகச்சிறிய கால அளவாகக் கருதப்பட்டதை, தாமரைப்பூவில் ஒரு

இதழில் ஊசி தைக்கும் நேரம் துடி என்று சொல்லப்பட்டதை,' தாமரை யின்னித முசிவுங் கோப்பது தாந் துடியாம்' ((கணக்கதிகாரம் பாடல் எண்.5)

துடி நூறு	–	இலவம்
இலவம் முப்பது	–	நிமிஷம்
நிமிஷம் இருபத்தேழு	–	குருவட்சரம்
குருவட்சரம் இருபத்தேழு	–	கடினம்
கடினம் நான்கு	–	காட்டம்
காட்டம் நான்கு	–	பிராம்மணம்
பிராம்மணம் ஆறு	–	வினாழிகை
வினாழிகை அறுபது	–	நாழிகை
நாழிகை மூன்றேக்கால்	–	ஒரு முகூர்த்தம்
முகூர்த்தம் இரண்டு	–	சாமம்
சாமம் இரண்டு	–	மத்தியானம்
சாமம் மூன்று	–	அபாரண்டம்
சாமம் நான்கு	–	ஒரு பகல்
சாமம் எட்டு	–	ஒரு மாதம்
மாதம் பன்னிரண்டு	–	ஓர் ஆண்டு.(கணக்கதிகாரம் பக்.25)

இதில் வினாழிகை, நாழிகை, முகூர்த்தம், சாமம் முதலான கால அளவுகள் சோதிட நூல் மற்றும் கோவில்களில் பயன்படுத்தப்படுகின்றன. நாள், மாதம், ஆண்டு முதலானவை அன்றாடம் புழக்கத்திலுள்ளவை.

''நாழிகை யேழரை நற்சாமந் தானாலாம்
பொழுதாகுங் காணாய் பொழுதிரண்டாய்த் - தோழி
தினமாகி முப்பது திங்களாய்ச் சேர்ந்த
தினவான தீரா றாண்டே''(கணக்கதிகாரம், பாடல் எண் 37)

ஏழரை நாழிகை ஒரு சாமம், நான்கு சாமம் ஒரு பொழுது, இரண்டு பொழுது ஓர் நாள், நாள் முப்பது ஓர் மாதம், பன்னிரண்டு மாதங்கள் கொண்டவை ஓராண்டு.

ஒவ்வொரு நாளும் நிலவு ஒரு நாள்மீனுடன் இணைவது கொண்டு நாளைக் கணக்கிட்டனர்.

˙ஆடு நண்டியங் கன்னி யரிமுப்பத் தொன்றாகும்

கேடில் கோல் தனுசு மாசி சிறந்த முப்பானதாகும்

தேடுற மிதுன முப்பானிரண்டதாகும் தேள் தைமாதம்

நீடும் வழியினாளே நீக்கு முப்பானிலொன்றே'' (சோதிட கிரக சிந்தாமணி, ப.28)

தமிழர் சித்திரை முதல் பங்குனி வரையான மாதங்கட்கு நாட்களைப் பகுத்தனர்.

'நின்னாள் திங்கள் அனையவாக திங்கள்

ஆண்டோர் அனையவாக ஆண்டே

ஊழி அனையவாக ஊழி

வெள்ள வரம்பினவாக என உள்ளிக்

காண்டு வந்திசின் யானே'(பதிற்றுப்பத்து 9,10 – 51-54)

என்ற வரிகளில் நாள், திங்கள், ஆண்டு, ஊழி, வெள்ளம், என்ற எல்லை வரை காலக் கணக்கீடு செய்யப்பட்டுள்ளது தெரிகிறது.

˙பல அடுக்கல் ஆம்பல் இணைத்து என எண்வரம்பு'' (பரிபாடல்.3: 45)

பரிபாடலில் வரும் இவ்வரியிலுள்ள ஆம்பல் என்ற சொல் ஆயிரம் வெள்ளம் எனப் பதிற்றுப் பத்து பாடலில் மூலம் அறியலாம். வெள்ளம் என்பது கோடி கோடியைக் குறிக்கிறது.

'நெய்தலும் ஆம்பலும் சங்கமும்

மையில் கமலமும் வெள்ளமும்'' (பரிபாடல்.2:13-14)

என்ற வரிகளில் ஆம்பல் என்பது பழந்தமிழர் கணக்கிட்ட ஆயிரம் கோடி கோடி (10^7) என்ற பெரிய எண் எனத் தெரிகிறது.

தமிழில் மட்டுமே மிக அதிகப்படியான எண்ணிக்கையைக் குறிக்கும் சொற்கள் உள்ளன.

எண்	ஒலிப்புச்சொல்	ஆங்கில ஒலிப்பு
1	ஒன்று (ஏகம்)	one
10	பத்து	Ten
100	நூறு	Hundred
1000	ஆயிரம்	Thousand
10,000	பத்தாயிரம்	Ten thousand
100,000	நூறாயிரம்(லட்சம் - நியுதம்)	Lakh
10,00,000	பத்து நூறாயிரம்	Million
1,00,00,000	கோடி	Core
10,00,00,000	அற்புதம்	
1,00,00,00,000	நிகற்புதம்	Billion
10,00,00,00,000	கும்பம்	
1,00,00,00,00,000	கணம்	
10,00,00,00,00,000	கற்பம்	Trillion
1,00,00,00,00,00,000	நிகற்பம்	
10,00,00,00,00,00,000	பதுமம்	
1,00,00,00,00,00,00,000	சங்கம்	
10,00,00,00,00,00,00,000	வெள்ளம் (சமுத்திரம்)	
1,00,00,00,00,00,00,00,000	அந்நியம்	
10,00,00,00,00,00,00,00,000	அர்த்தம்	
1,00,00,00,00,00,00,00,00,000	பரார்த்தம்	
10,00,00,00,00,00,00,00,00,000	பூரியம்	
1,00,00,00,00,00,00,00,00,00,000	பிரமகற்பம்(கோடி கோடி – முக்கோடி	

நிலத்தினை அளக்க உதவிய நீட்டலளவைக் குறிக்க பல வடிவங்களைப் பயன்படுத்தினர். முந்திரி என்பது 1/320, அரைக்காணி என்பது 1/160, காணி என்பது 1/80, அரைமா எனபது 1/40, ஒரு மா என்பது 1/20 என்று முறைப்படி பிரித்துள்ளனர். பிசிராந்தையார் பாடிய புறநானூற்றுப் பாடலில்

காய்நெல் அறுத்துக் கவளங் கொளினே,

மாநிறைவு இல்லதும், பன்நாட்கு ஆகும்

நூறு**செறு** ஆயினும்,தமித்துபுக்கு உணினே,

வாய்புகு வதனினும் கால்பெரிது கெடுக்கும்"(புறநானூறு 184-1-4)

இதில் ஒருமா என்பது நிலத்தின் அளவுகளில் ஒன்று செறு கழனியைக் குறிக்கின்றது. பாரதி காணிநிலம் வேண்டும், பராசக்தி காணிநிலம் வேண்டும் என்று காணி நிலத்தினைப் பராசக்தியிடம் வேண்டுகிறார்.

சிலப்பதிகார அரங்கேற்று காதையில் மாதவி ஆடிய நடன அரங்கத்தின் நீளம் எட்டுக் கோல், அகலம் ஏழுகோல், மேடை உயரம் ஒருகோல், மேடையிலிருந்து மேல் மட்டம் வரை உயரம் நான்கு கோல் என்று இளங்கோவடிகள் குறிப்பிடுகிறார். பழந்தமிழில் ஒரு கோல் என்பது இரண்டே முக்கால் அடியாகும்.

' நூல்நெறி மரபின் அரங்கம் அளக்கும்

கோல்அளவு இருபத்து நால்விரல் ஆக

எழுகோல் அகலத்து எண்கோல் நீளத்து

ஒருகோல் உயரத்து உறுப்பினது ஆகி

உத்தரப் பலகையொடு அரங்கின் பலகை

வைத்த இடைநிலம் நாற்கோல் ஆக

ஏற்ற வாயில் இரண்டும் பொலியத்

தோன்றி அரங்கில்..... ' (அரங்கேற்றுக் காதை 95-102)

நிலங்களை அளக்குமிடத்து தற்போதைய கணித முறையினைப் பயன்படுத்தியதை அறியலாம்.

'வட்டத் தரை கொண்டு விட்டத் தரைமாறப்

பட்டத் திருக்குணந் தான்பகரில் - திட்ட

இருகையால் பாதி யுடனே யதிற்பாதி

மரு வளரும் பூங்குழலே மாறு' (கணக்கதிகாரம். கணக்கு - 57)

'விட்டத் தரை கொண்டு வட்டத்தரை தாக்க

சட்டெனத் தோன்றும் குழி" (கணக்கதிகாரம். கணக்கு- 59)

வட்டச்சுற்றில் 32 எனில் அதில் பாதி 12. நடுவிற் கோல் 10. பாதிகோல் 5 இரண்டையும் பெருக்க கிடைப்பது 30 குழி. இன்றைய கணக்கு முறையில்

வட்டத்தரை = சுற்றளவு /2 = 2ðr/2=ðr

விட்டத்தரை = விட்டம்/2 =d/2=r (ஆரம்)

குழி (Area) = வட்டத்தரை × விட்டத்தரை

$= ðr \times r = ðr^2$

சரியாக ,பொருத்தமாக உள்ளது. மற்றொரு நூற்பா,

'விட்டம் அதனை விரைவாய் இரட்டித்து

மட்டுநான் மாவதனில் மாறியே – எட்டதனில்

ஏற்றியே செப்பியிடி லேறும்வட் டத்தளவும்

தோற்றுமெனப் பூங்கொடி நீ சொல்" (கணக்கதிகாரம. கணக்கு 61)

இங்கு மா என்பது 1/20, நான்மா என்பது 4x 1/20

ð = 2x4/20x8 = 64/ 20 = 3.2

மேலை நாட்டார் ð அளவை 22/7= 3.141 எனக் கணித்துள்ளனர். வட்டத்தின் பரப்பளவைக் காணவும், வட்டத்தின் சுற்றளவைக் காணவும் பயன்படும் குறியீடு ð. ஆரியப்பட்டர் என்ற கணித மற்றும் வானவியல் மேதை (கி.மு.499) ð க்கு 3.1416 என்ற மதிப்பை 62832 / 20000 என்ற வடிவில் உணர்த்தினார். நம் கணக்கதிகாரம் கூறும் ð ன் மதிப்பு 3.2.

எண்ணிக்கை:

கணக்கு அறிவிற்கு அடிப்படையாக விளங்குபவை கூட்டல், கழித்தல், பெருக்கல்,

வகுத்தல் முதலான கணக்கு முறைகள்.காலத்திற்குக் காலம் கணக்குச் செயல்முறைகளில் மாற்றம் ஏற்படினும் கணக்குகளின் அடிப்படை மாறுவதில்லை. வாழ்க்கையோடு பின்னி பிணைந்து விட்ட காரணத்தால் இவற்றின் தேவையும் அதிகம். கால மாற்றத்தினாலும், அறிவியல் முன்னேற்றத்தாலும் எளிமைப் பெற்றாலும் நம் முன்னோர்களினன மனக்கணக்கியலறிவு வியப்பிற்குரியது.

சங்க காலத்தில் கூட்டுத்தொகைச் சுவரில் கோடு கிழித்து நாட்களை எண்ணியதனை அகநானூற்றில்

சேண்உறை புலம்பின் நாள்முறை இழைத்த

திண்சுவர் நோக்கி நினைந்து கண்பனி

நெகிழ்நூல் முத்தின் முகில்முலைத் தெறிப்ப ... (அகம் 289)

தொல்காப்பிய நூற்பாக்களின் மூலமாக அக்காலத்தில் கூட்டல்முறை தோன்றியதற்கு,

மெய்பெறு மரபின் தொடைவகை தாமே

ஐயீ ராயிரத் தாறைஞ் ஞாற்றொடு

தொண்டுதலை யிட்ட பத்துக்குறை எழுநூற்

றொன்ப தென்ப உணர்ந்திசி னோரே (தொல்காப்பியம்- செய்யுளியல்- நூற்பா-96)

என்ற நூற்பா தக்கதொரு சான்றாகும் தமிழில் குறியீடுகள் தோன்றுவதற்கு முன்பே கூட்டல் முறைத் தோன்றியதை அறியலாம்.

கணிதத்தில் வழங்கப்படும் Arithmetic progression என்ற முறையினை நம் முன்னோர்கள் கையாண்ட விதத்தினைக் காணலாம். ஒன்றேற்ற எண்களின் கூட்டுத்தொகையைக் காண பாடல்

‘ஒன்றா யொருபத் தொருநூத் தாயிரமாய்

நின்றபதி னாயிரமாய் நேரே – குன்றாமல்

பாதியாய் நின்றதுகைக் குப்பயனெ ன்னுடனே

ஆதியாய் பெருக்கி அறி’’ (கணக்கதிகாரம் பாடல் எண் - 24)

எடுத்துக்காட்டாய், ஒன்று துவங்கி 10 அளவு எத்தகையதென்றால், 10 இல் பாதி 5, முதல் பத்தையும் ஒன்றையும் கூட்ட 11, இதனை 5ஆல் பெருக்க, 10X5=50, 1x5=5 ஆக 55.

இன்று நாம் கூட்டு சராசரி காண சூத்திரம் $n(n+1) / 2$ பயன்படுகிறது. பண்டைய முறைப்படி கணக்கை எடுத்தெழுதினால் $10/2(10+1) = 55$. ஆகவே, தமிழ்க் கணக்குகளில் முன்பே சூத்திரங்கள் பயன்பட்டமையை அறியலாம்..

ஒரு பலாப் பழத்தை அறுக்காமல் அதில் எத்தனை சுளையிருக்கும் என்பதனைக் கணக்கதிகாரம் துல்லியமாகக் கூறுகிறது.

தூங்குகின்ற பலாவின் சுளையறிய வேண்டினான்

ஆங்கிருந்த காம்பின் அருகிருந்த (முள்ளெண்ணிப்) பாங்காக

அத்தினால் மாறி அஞ்சினாலாய

உள்ளெண்ண வேண்டாஞ் சுளை" (கணக்கதிகாரம் பாடல்எண.- 89)

எடுத்துக்காட்டாக காம்பைச் சுற்றி 100 முள்ளிருப்பதாகக் கொண்டால் அதனை ஆறினால் பெருக்க 600. அதனை ஐந்தினால் வகுக்கக் கிடைப்பது 180.ஆக பலாப் பழத்திலிருப்பது 180 சுளைகள் என்று திட்டவட்டமாகக் கூறலாம்.

பூசணிக்காயின் உள்ளிருக்கும் விதையினைக் கண்டறிய,

கீற்றெண்ணி முற்றித்துக் கீழாறி னாறபெருக்கி

வேற்றஞ்சு தன்னில் மிகப்பெருக்க – பார்த்ததிலேலாவின்

பாதி யதின் மூன்றில் மத்தவிதை யாகும்

பூசணிக்காய் தோறும் வரை" (கணக்கதிகாரம் பாடல் எண்- 88)

கீற்றுக்களை எண்ணிக் கொண்டு அதனை முறையே 3,6,5 ஆல் பெருக்கி வரும் விடையைப் பாதியாக்கி மீண்டும் மூன்றால் பெருக்கினால் வருவது பூசணி விதையின் எண்ணிக்கை. சான்றாக ஆறு கீற்றுகள் பூசணிக்காயில் உள்ளதாகக் கொண்டால் 3,6.5 மூன்றையும் பெருக்கக் கிடைப்பது 90 அதில் பாதி 45 அதனை மூன்றால் பெருக்க 135 மேலும் ஆறு கீற்றுகளால் பெருக்கக் கிடைப்பது 810 விதைகள் பூசணிக்காயில் கண்டிப்பாக இருக்கும். என்னே! தமிழரின் அறிவு.

கணம்: (Set)

Set is a collection of well defined Object. கணம் என்பது நன்கறிந்த பொருள்களின் தொகுப்பாகும். பொது கணம், சேர்ப்புகணம், வெட்டுக்கணம், உட்கணம் எனப் பல வகைப் படுத்தலாம் என்பது இன்றைய கணிதவியலாரின் கூற்று. இதனை சங்க இலக்கிய அகநானூற்று

அமைப்பு முறையில் காணலாம். நானூறு பாடல்களைக் கொண்ட அகநானூற்றை 1 முதல் 120 பாடல்களை களிற்றியானை நிரை எனவும், 121 முதல் 300 வரையுள்ளவை மணிமிடைபவளம் எனவும், 301 முதல் 400 வரையுள்ள பாடல்களை நித்தலக்கோவை என்றும் பாகுபாடு செய்துள்ளனர். மேலும் ஒற்றை எண்ணாக வருபவை பாலைப் பாடல்கள் நான்கு எனும் எண்ணைப் பெறுபவை முல்லைத்திணைப் பாடல்கள் ஆறு எனும் எண்ணைப் பெறுபவை மருதத் திணைப்பாடல்கள் 10,20,30 எனும் வரிசையில் இறுதியில் பூஜ்ஜியம் பெற்றுப் பத்துப் பத்தாக வருபவை நெய்தல் திணைப் பாடல்கள், 2,8 என்னும் எண்களை இறுதியில் கொண்டு வருபவை குறிஞ்சித்திணைப் பாடல்கள். இதில் அடங்கியுள்ள தமிழரின் அறிவுத்திறன். நன்கறிந்த நானூறு அகப்பாடல்களின் தொகுப்பு என்பதால் அகநானூறு பொது கணம். (Union Set). களிற்றியானை நிரையும், நித்திலக்கோவையும், மணிமிடைபவளம் மூன்றும் அகநானூற்றுப் பாடல்களுக்குள் அமைந்த பாடல்கள் ஆகையால் இவை மூன்றும் உட்கணங்கள். மூன்று பாகுபாடுகளிலுள்ள ஒவ்வொரு திணைப் பாடல்களையும் பிரித்து எழுதினால் அவை சேர்ப்பு கணங்கள், ஒவ்வொரு திணைப் பாடல்களையும் தனித்தனி கணங்களாகக் கொண்டால் இவற்றை இணைக்கும் பொதுவான எண்கள் இல்லாத காரணத்தால் அச்சமயம் அது வெட்டுக்கணம் என்று அழைக்கப்படும். இவ்வாறு கணம் என்ற ஒன்று தோன்றுவதற்கு முன்பே முறைப்படி பட்டியலிட்டு பிரித்த தன்மையை நோக்கும் போது தமிழரின் கணக்கியல் அறிவினை அறியலாம்.

கணக்கினை வேப்பங்காயாய் நினைக்கும் என்ற இளைய தலைமுறையினருக்கு எளிய முறையில் மனதில் நிற்கும் வண்ணம் கற்று கொடுக்கும் முறையும், பண்டைய தமிழர்களின் கணிதத்தை என்னென்ன பார்வையில் பார்த்தார்கள் என்பதையும் இலக்கியங்கள் கொண்டு அறியலாம்

இசைக் கருவி - வீணை

ப. நாமகிரி

முன்னுரை

வீணை என்ற இசைக்கருவியானது இசையோடு, ராகங்களோடு, தொடர்புடையதாகும். ராகங்களை சீராக அபஸ்வரம் இல்லாமல் உணர்ந்துக் கொள்ள உதவுவது வீணையேயாகும். மதங்கர், பரதர் காலத்திலிருந்து ராகங்களை, ச்ருதி, சுரம் ஆகியவைகளை விளக்குவதற்கு வீணையையே பயன்படுத்தி வந்தனர். முற்காலத்தில் எல்லா நரம்பு கருவிகளும் வீணை என்றே அழைக்கப்பட்டு வந்துள்ளன. வீணைக்கு பல பெயர்கள் இதிகாசங்கள், புராணங்களில் காணப்படுகின்றன. பல வகை வீணைகளும் இடம் பெற்றுள்ளன.

வீணை பெயர்க்காரணம்

வீணை என்ற சொல்லும், அதற்குக் கொடுக்கப்பட்டுள்ள பெயர்களும் காரணப் பெயர்களாகும். வீணையின் நாதம் அதன ஒலி தனித் தன்மையுடையதாகவும், இத்தன்மையையுடைய ஒலியை எழுப்புவதால் இதற்கு வீணை என்ற பெயர் உண்டாயிற்று (சமஸ்க்ருத இலக்கியங்களில் இசைக் கருவிகள் பக்கம் 3). இக்கருவியிலிருந்து எழும் ஒலி அந்தந்த ஸ்வரங்களின் அபஸ்வரங்கள் மிகத் தெளிவாகக் கேட்கும் இதன் காரணமாக ‘‘வீணை’’ என்று பெயர் உண்டாயிற்று என்று அமர கோசத்தின் உரையாசிரியர் குறிப்பிட்டுள்ளார். வீணை என்பது பொதுப் பெயராகும். பரிவாதினீ, வல்லகீ, ராவணஹஸ்தா போன்ற பெயர்கள் சிறப்புப் பெயர்களாகும்.

சமஸ்க்ருத இலக்கியங்களில் ஏறத்தாழ நாற்பத்தி இரண்டு வகையான வீணைகளும் அதனை கையாளும் விதம், பாகங்கள் என பல செய்திகள் காணப்படுகின்றன. கீழே கொடுக்கப்பட்டுள்ளன. அவைகள்:

முனைவர்பட்ட ஆய்வாளர், உதவி பேராசிரியை இசைத்துறை (வீணை), கலைக்காவிரி நுண்கலைக் கல்லூரி, திருச்சி.

1	ப்ரும்ம வீணை	22	அம்பிகா வீணை
2	கைலாச வீணை	23	பாண வீணை
3	ஸாரங்க வீணை	24	காஸ்யப வீணை
4	கூர்ம வீணை	25	ஸ்வயம்பவ வீணை
5	ஆகாச வீணை	26	புஜங்க வீணை
6	மார்க வீணை	27	போஜ வீணை
7	ராவண வீணை	28	த்ரிசரீ வீணை
8	கின்னரீ வீணை	29	ஸரஸ்வதீ வீணை
9	லகு கின்னரீ வீணை	30	மௌலீ வீணை
10	ராவண ‘ஸ்தா வீணை	31	மநோ‘ாதா வீணை
11	விபஞ்சீ வீணை	32	கணநாத வீணை
12	பரிவாதினீ வீணை	33	கௌமார வீணை
13	ஸ்வர மண்டரீ வீணை	34	சைத்ரிகா வீணை
14	கோஷ்வதீ வீணை	35	நாட்ய நாகரிகா வீணை
15	ஒள தும்பரீ வீணை	36	கும்பிகா வீணை
16	கச்சபீ வீணை	37	காஸாரீ வீணை
17	வல்லகீ வீணை	38	தந்த்ரீ ஸாகர வீணை
18	பினாகீ வீணை	39	அம்புஜ வீணை
19	நகுலா வீணை	40	காந்தர்வ வீணை
20	விநோத்தமா வீணை	41	பத்ம வீணை
21	கௌரீ வீணை	42	துலஜா வீணை

நமது இதிகாசங்களான மகாபாரதம், இராமாயணம் ஆகியவற்றிலும் வீணையின் குறிப்பு காணப்படுகிறது.

இராமாயணத்தில் காணப்படும் வீணை தொடர்புடைய செய்திகள்

இராவணன் வீணை வாசிப்பதில் வல்லவன் என்றும், ராவணனின் கொடிக்கு ''வீணையே'' அடையாளமாக இருந்தது என்றும் வால்மீகி இராமாயணத்தில் குறிப்பிடப்பட்டுள்ளது. ராவணனின் அந்தப்புரப் பெண்கள் இரவு முழுவதும் வீணை வாசித்து களைத்து போய் வீணையிலேயே சாய்ந்து உறங்கினர் என்ற குறிப்பும் காணப்படுகிறது.

ராமனின் புதல்வர்களான லவன், குசன் இருவரும் ராமாயணத்தை ஒருவர் பாட, ஒருவர் வீணையில் வாசித்தனர் என்ற செய்தியிலிருந்து வீணை என்ற இசைக் கருவி ராமாயண காலத்திலேயே இருந்துள்ளது என்பதை அறிய முடிகிறது.

மகாபாரத்தில் காணப்படும் வீணை தொடர்புடைய செய்திகள்

பஞ்ச பாண்டவர்கள் ஒரு வருட மறைந்திருந்து விராட நாட்டில் வாழ்ந்து வந்தனர். அக்காலத்தில் அர்சுணன் பிருகன்னளையாக பேடி வடிவத்தில் இருந்தபோது விராடனின் மகளுக்கு நாட்டியம், வீணை முதலியவற்றை கற்றுத் தந்ததாகவும், அர்ச்சுணன் வீணை வாசிப்பதில் வல்லவன் என்பதும் புலப்படுகிறது. இந்த வீணை சப்த நரம்புகளைக் கொண்ட வீணையாகும். பல நூற்றாண்டுகளுக்கு முன்பே வீணை புழக்கத்தில் இருந்தது என்பதும் வீணையின் அடிப்படையான 7 தந்தி அமைப்பு மாறாமல், வீணை செய்ய பயன்படுத்தும் மரங்கள், வீணை தண்டம், தந்தி, அவற்றின் அமைப்பு முறைகள் மட்டுமே மாற்றமடைந்து தற்போது நாம் கையாளும் ரகுநாத நாயக்கர் காலத்து வீணையாக வடிவம் பெற்றுள்ளது எனலாம். சமஸ்க்ருத்தில் நரம்புக் கருவிகள் யாவற்றையும் ததம் என்றே அழைக்கப்பட்டு வந்துள்ளது (பக்கம்-6). மேலே குறிப்பிடப்பட்டுள்ள 42 வகை வீணைகளுள் சிலவற்றின் அமைப்பு, வாசிக்கும் முறை, பாகங்கள் ஆகியவற்றைப் பற்றி பார்ப்போம்.

ப்ரும்ம வீணை

தற்காலத்தில் ''துந்தினா'' என்றழைக்கப்படும் இசைக்கருவியாகும். ஒரு தந்தி வாத்தியம் என்றும் கூறலாம். சுருதியும் தாளமும் மட்டுமே கிடைக்குமாறு சுரை குடுக்கை அல்லது பரங்கி குடுக்கையின் மேல் ஒரே ஒரு தந்தி இழுத்து கட்டப்பட்டிருக்கும். கருங்காலி மரத்தால் செய்யப்படும் இந்த வீணைக்கு "ப்ரும்ம வீணை" என்று பெயர்.

கின்னரீ வீணை

இந்த வகை வீணை சிறிய கின்னரீ, பெரிய கின்னரீ என இருவகைப்படும். மூன்று குடங்களைக்கொண்டது. பெரிய கின்னரீ, இரண்டு குடங்களையுடையது சிறிய கின்னரீ யாகும். மெழுகு சட்டம், கம்பிகள், இடம், நாதம் என பல வேறுபாடுகள் உண்டு. கின்னரீ என்ற வகை வீணையானது கடல் கடந்து செல்வதற்கு அலெக்சாண்டர் காரணமாவார்.

இதன் நாதத்தால் கவரப்பட்டு, வீணையையும், வீணை மீட்டும் இசைக் கலைஞர்களையும் தன்னோடு அழைத்துச் சென்றதாக வரலாறு சான்றுகள் உள்ளன.

விபஞ்சீ

இந்த வீணையில் ஸ்வரங்கள் மிக துல்லியமான நாதத்தை எழுப்புவதாக அமைந்துள்ளதால் இதற்கு விபஞ்சீ என்று பெயர் ஏற்பட்டது. இதில் நான்கு தந்தி வாசிப்பதற்கும் ஒரு தந்தி தாளத்திற்கும் அமைக்கப்பட்டிருக்கும். சந்தனம், மூங்கில் ஆகிய மரங்கள் வீணை செய்ய பயன்படுத்தப்படுகின்றன.

பரிவாதினீ

இந்த பெயரில் பல்வேறு வீணைகள் காணப்படுகின்றன. இவை 7,13,14 தந்திகளைக் கொண்டவையாகும். இவை பொதுவாக பரிவாதினீ என்றழைத்தாலும் 7 தந்தி உடையதிற்கு ''ஸப்தயா'' என்றும் 11 தந்திகளைக் கொண்டதற்கு ''ஏகாதசீ வீணை என்றும் 14 தந்திகளை உடையதற்கு ''சதுர்தசீ வீணை'' என்றும் குறிப்பிட்டு அழைக்கப்பட்டு வந்துள்ளன. பரிவாதினீ என்று பொதுவாக அழைக்காமல் கையாளப்படும் தந்தியை அடையாளமாக வைத்து அழைக்கப்பட்டு வந்துள்ளது. ஸ்பத, ஏகாதச, சதுர்தஸ என்பது முறையே 7, 11, 14 எண்ணை குறிப்பதாகும். பரிவாதினீ வீணை மஹேந்திர பல்லவன் காலத்தில் புதிய வடிவம் பெற்றது என்பதற்கு வரலாற்று சான்றுகள் காணப்படுகின்றன.

ஔதும்பரீ

உதும்பரம் என்ற மரத்தால் செய்யப்பட்ட வீணையானது வேதங்களில் காணப்படுகிற வீணையாகும்.

பினாகீ வீணை

பினாகம் என்பது சிவ பெருமான் கையிலிருக்கும் வில்லின் பெயராகும். சிவபெருமானுக்கு ''பினாகபாணி'' என்ற பெயருமுண்டு. இந்த வீணையானது சிவனுடைய வில்லான பினாகத்தை ஒத்த அமைப்புடையதாக பினாகீ என்று அழைக்கலாயிற்று. தற்போது மணிப்பூர் மக்கள் கிராமீய இசையில் பயன்படுத்தப்படும் வீணைக்கு பீனா என்று பெயர். இந்த வீணை மூங்கில் மரத்தில் செய்யப்பட்டதும், குதிரை முடியை பயன்படுத்தப் பட்டிருப்பதால் வயலின் தோன்ற முன்னோடியாக இருக்கும் என்று கருதப்படுகிறது (பக்கம் 21).

கச்சபீ

இது சரஸ்வதி தேவியின் கையில் உள்ள வீணை என்றறியப்படுகின்ற வீணையாகும். கி.மு.200-க்கும், கி.பி. 400-க்கு இடைப்பட்ட காலத்தில் இருந்ததாக இசை ஆராய்ச்சியாளர்களின்

கருத்தாகும். அஜந்தா, நாகர்ஜுன குண்டா போன்ற குகையோவியங்களில் காணப்படும் வீணைஓவியங்கள் இந்த வகை வீணையைச் சேர்ந்ததாகும். தற்போது இவ்வகை வீணை வழக்கில் இல்லாதிருந்தாலும் பிலிப்பைன்ஸ் நாட்டில் கட்ஜ்யாபி என்ற பெயரின் கையாளப்பட்டு வருகிறது.

ராவண 'ஸ்தா

ராவணன் ஒரு சமயம் சிவனை நினைத்து தவமிருக்கும்போது சிவ தரிசனம் கிடைக்காமல் போய்விட்டது. அப்போது ராவணன் தனது ஒவ்வொரு தலையாக் கொய்து ே'ாமத்தீயிலிட்டான். அப்போதும் சிவன் காட்சியளிக்காமல் போகவே சிவனை மகிழ்விக்கும் பொருட்டு காட்டிலுள்ள மூங்கிளைவளைத்து சுரைக் குடுக்கையில் பொருத்தி, அவற்றில் நரம்பை இணைத்து வீணை செய்து இறைவன் மீது பாட்டிசைத்து இறைவனை மகிழ்வித்தான் என்றும் இறைவன் மகிழ்ந்து வரமளித்தார் என்றும் இதிகாசங்கள் கூறுகின்றன. இதன் காரணமாக இப்பெயர் ஏற்பட்டுள்ளது எனலாம்.

ராவண வீணை

ராவண 'ஸ்த வீணையிலிருந்து முற்றிலும் மாறுபட்ட ஒரு வகை வீணையாகும். குறிப்பாக இது துந்தினாவின் ஒரு வகையாகும்.

வல்லகீ

அமர கோசத்தில் அமச சிம்மனால் குறிப்பிடப்பட்டுள்ள வீணையாகும். இதை மீட்டும் போது அதன் அதிர்வானது ஸ்வரங்களை உண்டாக்கும் போது அந்த நாதமானது மிக விசேஷமான தன்மையுடைய காரணத்தினால் இப்பெயர் வழங்கலாயிற்று.

ஆகாச வீணை

இந்த வீணையின் வாசிக்கும் முறையும், பிணாகி வீணையின் வாசிக்கும் முறையும் ஒத்ததாக அமைந்துள்ளது. இரு வீணைக்கும் குடம் என்ற பகுதி இல்லாததினால் இரண்டும் வாசிக்கும் முறையில் ஒத்த அமைப்புடையதாக இருக்கிறது.

அர்த்த வீணை

இது வீணையில் பாதியாக இருப்பதால் இது காரணப் பெயராக அமைந்துள்ளது. தற்காலத்தில் தம்புராவாக பயன்படுவதாகும். இதற்கு மறுபெயர் தும்புரு வீணை. இதில் தும்பம் கிடையாது.

கூர்ம வீணை

இவ்வீணை மூன்று வகையாகப் பிரிக்கப்படுகிறது. வக்ரா, கூர்மா, அலாபூ எனப்படும்.

அலாவணீ

இவ்வீணையைப் பற்றி சோமேஸ்வர் தமது நூலில் வாசிக்கும் முறை விரலடி, தேவையான பொருட்கள் அலாபி வீணையின் லக்ஷணங்கள் என பலவற்றினைப் பற்றி குறிப்பிட்டுள்ளார்.

மதங்க கின்னரீ வீணை

கின்னரீ வீணையின் இரு வகைகளான பெரிய கின்னரீ, சிறிய கின்னரீ என்பவற்றிற்கு இடைப்பட்டது இந்த மதங்க கின்னரீ வீணையாகும். இதற்கு ''மத்யம க்ராமகா'' என்று வேறு பெயரும் உண்டு. இவ்வகை வீணையின் வெளிப்புரத்தில் ஷட்ஜ மத்யமத்திற்காக (தாளத்திற்கு) இரண்டு தந்திகள் பொருத்தப்பட்டிருக்கும். இவை மத்யம கிராமத்தில் அமைக்கப்பட்டிருப்பதால் ''மத்யமக்ரமகா'' என்ற பெயரும் அழைக்கப்படுகிறது.

ஸ்வரமண்டலிகா அல்லது மத்த கோகில வீணை

நாராயணர் என்பவர் தனது நூலில் 21 தந்திகள் இடம் பெற்றுள்ள வீணை என்று குறிப்பிட்டுள்ளார்.

நகுலா வீணை

இந்த வீணையைப் பொருத்த வரையில் தந்தி அமைப்பில் ஒருசில கருத்து வேறுபாடுகள் காணப்படுகின்றன. இரண்டு தந்திகளும் அதற்கு இணையாக ஸ்வரத்தை ஒலிக்கும் மூன்று தந்திகளும் மொத்த ஐந்து தந்திகள் என்றும் வேறு சிலர் மூன்று மூன்று என்று ஆறு தந்திகளும் என்றும் குறிப்பிட்டுள்ளனர்.

ரகுநாத மேள வீணை (1600-1630)

17-ஆம் நூற்றாண்டில் தஞ்சையை ஆண்ட நாயக்க மன்னரான ரகுநாத மன்னர் புகழ்பெற்றவர் இவரது காலத்தில் வீணையானது பல நல்ல மாற்றங்களைப் பெற்று புதிய வடிவம் பெற்றது எனலாம். இவரது காலத்தில் உருவான வீணையாதலால் இப்பெயர் பெற்றது. இவரது காலத்தில் ஆறு வகை வீணைகள் புழக்கத்தில் இருந்தள்ளன.

துளஜா வீணை (1729-1735)

18-ஆம் தஞ்சையை ஆண்ட மராட்டிய மன்னரான இவர் தனது காலத்தில் ஒரு

வீணையை கண்டுபிடித்து அதைப்பற்றி தமது நூலில் குறிப்பிட்டுள்ளார். இதற்கு துளஜேந்திர வீணை என்ற பெயர் குறிப்பும் காணப்படுகிறது. இந்த வீணையின் சிறப்பம்சமாக தந்த வேலைப் பாடுகளுடன், அதனிடையேயுள்ள சிறிய துளைகளின் வரிசையுமேயாகும். தஞ்சையை ஆண்ட நாயக்கர், மராட்டிய மன்னர்கள் இவர்கள் காலத்தில், கலை வளர்ச்சி மட்டுமின்றி இசைக் கருவிகள் வளர்ந்ததும், மாற்றடைந்த வீணை புதிய பரிணாமத்தில் வளர்ச்சியடைந்து நமக்கு கிடைக்கப் பெற்றள்ளது எனலாம்.

ருத்ர வீணை

வட இந்தியாவில் கையாளப்படும் இசைக்கருவியாகும். இவ்வீணை லகு கின்னரீ வீணையின் வளர்ச்சி என்றும், கிராமிய கலையில் பயன்படுத்திவரும் தண்டியின் வளர்ச்சியென்றும் இசை ஆய்வாளர்களின் கருத்தாகும். இந்த வீணையின் வாசிக்கும் முறையானது கின்னரீ வீணை வாசிப்பை ஒத்துள்ளது.

வெங்கடாத்வரி வீணை

''சதுர்தண்டி ப்ரகாசிகா'' என்ற நூலை எழுதிய ''வேங்கட மகி'' இந்த வீணை உருவாகக் காரணமானவராவார். தனது நூலில் இந்த வகை வீணையைப் பற்றி பல குறிப்புக்களையும், இரு வீணைகளை கண்டுபிடித்துள்ளதாகவும் குறிப்பிட்டுள்ளார். இவர் கண்டுபிடித்த வீணை இவரது பெயரால் வெங்கடாத்வரி வீணை என்றழைக்கப்படுகிறது.

தும்பரீ

முற்காலத்தில் கையாளப்பட்டுவந்த தம்புரா வகையைச் சேர்ந்ததாகும். தற்போது நாம் பயன்படுத்தும் தம்புரா என்பது பல்வேறு பரிணாம வளர்ச்சியடைந்துள்ளது எனலாம். நான்கு தந்திகளைக் கொண்ட தும்பரீ வீணையில் ஒரு தும்பம் மட்டுமே காணப்படுகிறது. கலிகா என்ற ஜீவெஸ்தானம், சங்குகள் (பிருகடைகள்) நான்காகும். வீணையில் இருக்கும் மெழுகு சட்டம் இதில் காணப்படவில்லை. எனவே பார்ப்பதற்கு இதன் தோற்றம் தம்பூராவை ஒத்துள்ளது.

கபிலாஸிகா வீணை

மிகப் பழமையான வாத்யங்களுள் கபிலாஸிகா வீணையும் ஒன்றாகும். இந்த வீணையைப் பற்றி நாரயணர் தமது நூலில் குறிப்பிடப்பட்டுள்ளார்.

ஸாரங்வீணை

கின்னரீ வீணையின் மாற்றமே, வளர்ச்சியாக ஸாரங்க வீணையாக உருவானது எனலாம். 'ரிபாலர் ஸாரங்க வீணையின் இலக்கணத்தை குறிப்பிட்டுள்ளார்.

நாராயணர் (14-வது நூற்றாண்டு) தமது நூலில் ஸாரங்க வீணையைப் பற்றிக் குறிப்பிடுகையில் 3 தந்திகள் கொண்டது எனவும், வாசிப்பதற்கு 30 அங்குல அளவுள்ள மூங்கிலால் செய்யப்பட்ட வில் பயன்படுத்தப்படுகிறது என்று குறிப்பிட்டுள்ளார்.

தற்காலத்தில் கையாளப்படும் வீணையானது தஞ்சாவூரில் செய்யப்படுவது தஞ்சாவூர் வீணை என்றும், மைசூரில் செய்யப்படுவது மைசூர் வீணை என்றும் அழைக்கப்படுகிறது. தஞ்சாவூர் வீணை என்பது ரகுநாத நாயக்கர் காலத்திலிருந்து பல மாறுதல்கள் அடைந்துள்ள வீணையாகும்.

முடிவுரை

முற்காலத்தில் நரம்பு கருவிகள் எல்லாவற்றிற்கும் வீணை என்றே அழைக்கப்பட்டுவந்துள்ளது என்பது மேற்கூறிய வீணை வகைகளிலிருந்து அறிந்து கொள்ள முடிகிறது. நாற்பத்தி இரண்டு வகை வீணைகளின் குறிப்புகளும் சேகரிக்க முடியவில்லை. சில வீணைகளின் குறிப்புக்கள் காணப்படவில்லை. சில வீணை வகைகளில் யாழினை ஒத்த அமைப்புக்களும் வேறுசில வீணைகளின் அமைப்பானது வயலினுக்கு முன்னோடியாகவும் உள்ளது என்பதை அறிந்துக் கொள்ள முடிகிறது. வீணையானது 17-ஆம் நூற்றாண்டில் தஞ்சையை ஆண்ட ரகுநாத நாயக்கர் ஆறு வகையான வீணைகள் புழக்கத்தில் இருந்துள்ளன. அவைகள் பலவிதமான மாறுதல்களுக்கு உட்படுத்தப்பட்டு இன்று நாம் வாசிக்கும் வீணையாக வளர்ச்சியடைந்துள்ளது எனலாம். பல வகையான வீணைகள் வகைப்படுத்தப்பட்டிருந்தாலும் ஒரு சில காரணங்களினால் வாசிக்கும் முறை கையாளுவதில் சிரமம், வாசிக்க திறமையின்மை இவ்வாறு பல காரணங்களினால் காலத்தால் அழிந்தாலும் பல விதமான மாற்றங்களுடன் நாம் வாசிக்கும் வீணையாக நமக்குக் கிடைத்துள்ளது எனலாம்.

துணை புரிந்த நூல்கள்

1 Musical Instruments of India — B.Chanitanya Devi

2 ஸமஸ்க்ருத இலக்கியங்களில் இசைக்கருவிகள் — தஞ்சாவூர் மகாராஜா சரபோஜியின் வீணை சரசுவதி மஹால் நூலகம்.

POLITICAL ACHIEVEMENTS OF WOMEN IN TAMIL NADU

***B. Meharunnisha, **Dr. C. Tamilchelvi**

Introduction

Political status of women can be defined as the degree of equality and freedom enjoy by women in sharing of power and in the value given by society to the role of women. Women's political background shows that they are far away from the equal status along with men. Equal status is not enjoyed by women and men anywhere in this world and there is difference in the opportunities available for them. In the power hierarchy, women remain at the lowest level and are powerless which is due to their illiteracy, lack of awareness, lack of information and knowledge about markets and skills. Without women's political empowerment and active political participation in decision making processes, women's life-situation cannot be altered. The two major forces which acted as cataclysts in the achievements of political equality of women were the national movement and the leadership of Mahatma Gandhi[1]

This study attempts to enumerate the political empowerments in women Tamil Nadu, aimed at the achievement of women.

Statement of the problem:

The Economic status of women is considered as an indicator of a society's development. The real indicators to measure the status of women are the level of economic independence and equality in a society. The status of women in contemporary Indian society is better than that of previous period. Many legal disabilities of women were removed by series of Act after independence. Equal rights in society have been guaranteed to women by the Indian Constitution.

In India in general and in Tamil Nadu in Particular, many welfare schemes have been implemented for the betterment and empowerment political achievement of women. Because of

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the implementation of the welfare measure and schemes, women have reached important positions in making decision. In spite of a number of political acievements taken by Central and State Governments, The status of women, still, is found deplorable. Hence an attempt has been made to study the affective implementation of women political awareness in Tamil Nadu.

Scope of the study:

The present study makes a socio-economic approach to the problem of women political measure Implemented by the Tamil Nadu Government, mainly on the causes and consequences of women welfare measures during the period after independence. The study is made in social and legel proception relating to the upliftment of the womenfolk in Tamil Nadu**.**

Methodology of the study

This is a ex-post facto evaluation study in historical perspective using descriptive and analytical techniques. Where are possible attempt has been made to quantity data and present data in the form statistical tables. Simple statistical tools have been used to analysis data to arrive to logical conclusions.

Sources

The study has predominantly used Primary Sources. This study depends more on primary Sources like the Indian Constitution, Central Government orders, Lok Sabha Debates, Legislative Assembly Debates, Tamilnadu State Governments Orders, Policy Notes and Proceedings on Education and Records.

Further the Secondary Sources related to women issues such as published works, journals, research papers, articles, souvenirs, newspapers, magazines, encyclopedias etc., have also been used.

During the early Vedic period, women were educated, civilized, enjoyed equal rights to men and they had high status in the society. But this high status of women started to deteriorate with the advent of the sutra period (600-300 B.C). During the Sangam age, the women of Tamil Nadu were treated well and they enjoyed high status in the society. Tolkappiyam clearly tells the status of women during the Sangam period. The status of women under the Pallavas, imperial Cholas and pandyas was high but the education imparted to women was different when it is compared to men. During the Vijayanagar period, the position of women was good and they occupied an honourable place in the society[2]. Some women under Vijayanagar Empire were highly educated

and were good poetes's. During the Modern period, the national movement gave an opportunity for women to participate in the political activities of the country. During this period both the men and women participated in the national movement and their unity and sacrifice paved way for the success of national movement and success of women in political movement. This laid the foundation for the political awareness among women and this served as a natural cause for women to start women's movement which aimed at equal rights for both men and women. Political participation is closely related to the women's franchise and the right to vote enjoyed by the women helps in determining the degree of women's political participation as well as in decision-making[3].

In the year 1801 Madras Presidency was formed and the English East India Company started to rule over Tamil Nadu. The rule of East India Company came to end in the year 1858 by the Government of India Act. The various revolutions and wars which took place in the different parts of the world like the French revolution, the Russo-Japanese war, the socialist preaching of the Marxists and its impacts helped the Tamil people to protest against the British domination in Tamil Nadu. The period from 1857-1947 was called as the era of empowerment of women. During this period many women forgot their homes and worked for national struggle[4]. This experience helped the Tamil women enter in to the political field and gave them more confidence and strength. Women's political demonstrations in Tamil Nadu were less dramatic than those in either Bombay or Bengal. Women picketed and marched in processions but it was always difficult to mobilize large number of women for action. Support for the swadeshi pledge and for spinning, wearing, and selling khaddar could be mustered, but there were no dramatic demonstrations of the kind found in Calcutta and Bombay.

Madras women never joined the revolutionary movement, nor were they subjects of extreme police violence. Participation in the political process provides an opportunity to the women to make the political system to reflect their aspirations and ambitions and at the same time lends legitimacy to the system which is the hallmark of democracy. Before Independence, there were few women rulers, administrators and warriors. Occasionally women were appointed regents when the ruler was a minor[5].

The advent of Gandhi gave a boost to the life of women which was awakened by foreign administration and socio- political situations. He encouraged women to take part in the National, Political and Social movements of the nation. According to him, "freedom struggle was a struggle for the country's freedom as well as the freedom of women" and he worked for both. From the beginning of his political activities, he associated himself with women's cause and sought their help when necessary.

The early twentieth century saw the birth of women's organizations and the beginnings of the demand for political rights. The women's Indian Association was started in Madras in 1917. The main motive of this association was the upliftment of women and the achievement of social equality. Women were glad since the association gave them the opportunity of meeting together in their free afternoon hours for mutual help. In 1917, a deputation of Indian women led by Sarojini Naidu presented to the British Parliament a demand for the enfranchisement of women on the basis of equality with men. The women in Madras presidency organized the young people which were named the Vaanar Sena. This organization sowed the seeds of patriotism in the minds of girls and boys[6].

Margaret Cousins, an Irish lady took important steps towards the upliftment of women in Madras Presidency. She wrote to Prof. D.K. Karve at Poona enquiring about the possibility of a deputation to wait upon the Secretary of State and Viceroy. Accordingly, a deputation under the leadership of Sarojini Naidu met E.S. Montague, the Secretary of State of India and Lord. Chelmsford, the Governor General and Viceroy of India in Madras on 18 December 1917. The main demand was the right of women for vote.

The Congress supported their demand by passing a resolution at the Calcutta session under the president ship of Annie Besant. The Bombay special Session of the Congress and the Delhi Session of the National Congress supported the cause. The Muslim League also supported Women's enfranchisement in September 1918. The Thirty-Third Session of the Indian National Congress met in Delhi in December of 1918. Saraladevi Chaudhurani presented the resolution supporting the vote for women. She also told her audience that women had as much right to chart their own destinies as men for this was the age of human rights, justice, freedom and self determination[7].

Political Status of Women

The two important political rights sanctioned to women by the Indian Constitution were female enfranchisement and eligibility for the Legislature. Modern women had to face a complex life and thus they had to face various changes in life. Her primary biological function of motherhood was slowly receding and its place had gradually been taken by manifold political activities. The constitution of India pledges equality of status and opportunity, justice, social, economic, political and dignity of the individual were given equally to men and women. In fact, Gandhiji had visualized transformation of women's roles and responsibilities in the task of national reconstruction.

Political equality is granted to women under the Indian constitution and is guaranteed through the instrument of adult franchise and Article 15 prohibits discrimination on grounds of sex. The political parties have generally been in Different towards women, treating more as appendages to men. For example, working women and women professionals do generally tend to have high level of awareness but this is not reflected in the level of their participation in the political process[8]. Viewed from the angle, the level of participation among women is generally low except in voting and perhaps attending meetings.

Women Political Leaders

Tamil Nadu is the most orthodox state because, traditional Hindu culture is Large followed by majority of women. It makes only women to play the role of 'help mate ', wife, mother etc. It does not help them or inspire them to become an M.L.A., M.L.C., M.P. or Minister. After Independence, there has been a very slow change to women's political participation in Tamil Nadu. After the regional parties coming to power in Tamil Nadu it increased the women's political participation. The women's education infused necessary confidence in women and soon a large number of women entered many fields of social service like working for prison reforms, fighting against alcoholism, cruelty to children, slavery and fought for feminine causes like reforms in marriage and divorce laws.68 More and more educational opportunities and employment avenues were thrown open to women. Exposure to reformist movements, economic independence, Indian National Movements, influence of western feminist movements, - all helped women to go a long way in bringing about drastic changes in their position and attitudes. These were the important factors for women's political participation in Tamil Nadu. The women leaders of Tamil Nadu also did their work effectively and successfully[9].They are as follows,

Dr. Muthulakshmi Reddy

Dr. Muthulakshmi Reddy was the eldest daughter of Narayana Swamy Iyer and Chandrammal, born in Puthukottai State on 30 August 1886. She was the first girl student in the state to seek education and complete all her studies on State scholarship. In 1912 she completed her medicine study and she was also the first woman doctor of Madras Medical College. Then she worked as the house surgeon in the government hospital for women and children in Chennai. She was more interested in social work, specially social and political upliftment of women and in improving the condition of children than in political activity. In 1913 she entered social welfare service and was connected with the Women's Indian Association of Madras in 1917.

She was the first woman legislator nominated as a member of Madras Legislative Council

in 1926. She was the first woman to be a member of any legislature in India. She was the first woman in the world to become the vicepresident of a legislature. From 1927 to 1930 was the period of her greatest contribution in the field of social service and national activity by bringing forward resolutions in the legislature. During 1928-1929, Rao Sahib Haribilas Sarada introduced the Sarada Bill for the prevention of child marriage in the Legislative Assembly in the Government of India. This provoked much controversy and opposition from the orthodox section of Hindu society. The author of the Bill appealed to all Women's Associations to extend support for the passage of the Bill. Dr. Reddy addressed many public meetings all over India and through All India Women's Conference arranged a deputation to wait upon Lord Irwin. It was she who moved a resolution in the Madras Legislative Council for raising the age of marriage for girls and it was unanimously accepted by the council. She recommended to the government that the minimum age for marriage be raised to at least 21 for boys and 16 for girls[10].

Another crusade started by Dr. Muthulakshmi Reddy was against Devadasi System in the state. She felt that it was the greatest injustice and a violence of human rights. The resolution in this report did come up before the Council and Dr. Reddyhad the honour of moving it after her great oratory and moving speech. She was the prime mover behind the legislation that abolished the devadasi system in 1929. The Council was moved by her speech and all the parties unhesitatingly supported her motion. Then law member Sri C.P. Ramaswamy Iyer pointed out that there were certain difficulties in giving practical effect to the resolution on behalf of the Government. Nevertheless, the Madras Legislative Council recommended the motion unanimously to the government. A Bill to abolish the Devadasi System in the temples was introduced in 1929 after getting the necessary permission from the Government of India. The efforts of Dr. Reddy did not go unchallenged. There were oppositions and efforts made by some anti-progressive people to prevent the bill from beginning law. But Dr. Reddy was able to swim against the opposition and saw to it that the Bill was passed into Law by February, 1929. She also made efforts to remove the provisions of Penal Code relating to Sections 372 and 373. In 1930 an Act for the suppression of brothels and immoral traffic was piloted by her and passed. Through her hard work she got seats reserved for women in Local Bodies.

From 1924 to 1936, she was the Secretary and organizer of the Madras Children's Aid Society. In 1930 she became the president of the fifth All India Women's Conference held at Lahore and continued to be its president and vice president till 1935. In 1930, she founded the Avvai Home at Adayar, Madras for the neglected, vagrant and destitute children. In 1937 she became the first Alderwoman of the Madras Corporation for two years. During this period she

involved herself in the beggar problem, children's education and child welfare etc.

With the courage and tireless work of Dr. Reddy, she founded Cancer Institute at Adayar, Madras on 1954. Again she was elected a member of Legislative Council from 1952 to 1957. She was the first Chairperson of the State Social Welfare Advisory Board from 1954-1957[11]. In 1956 the Government of India gave her title of 'Padma Bhushan' to her service for the women and children in India. She wrote more than ten books in English. They are "Care of pregnant Women", "Infant feeding", "Infant morality in India", "Indian women's franchise", "Care of children", "Evils of child marriage", "Cancer and its prevention", "Mrs. Margaret Cousines work in India", "My Experience as a Legislator" and "Why should Devadasi Institution in Hindu Temples be Abolished". She also wrote W.I.A.'s monthly journal Stri-Dharma in both Tamil and English language. She died on 22 July 1968. Her roles in women service enhanced the betterment of women in Tamil Nadu.

Ammu Swaminathan

Ammu Swaminathan was born on 22 April 1894 in the Palghat District of Kerala. She was the youngest daughter of Govinda Menon and Ammu Amma. She had only primary school education but later she became very popular in social welfare work and political participation. She married to a famous barrister at the age of 13. She was a founder member of the All India Women's Conference started in Madras.86 In 1934 she joined the Indian National Congress. From 1934 to 1939, she was a member of the Madras Corporation.

She participated in freedom struggle in 1942 and was jailed for 2 years. In 1945, she was elected the member of Central Legislative Assembly. In 1946, she served as a member of Constituent Assembly of India. In 1948 she went to Ethopia, China, USA and USSR as an ambassador of India. In 1949 she represented India in UNESCO conference held at Geneva. In 1950 she was elected the member of Lok Shaba. In 1957-1960 she was a member of Rajya Sabha from the state of Madras. She had served as president of Bharat Scout and Guides from November 1960 to March 1965. She was also a member of Regional and Central boards of film censors and the film award committee and was the president of the Madras film society. She died on July 4, 1978. Her immense service was promoting the status of women in Tamil Nadu[12].

Rukmani Lakshmipathy

Rukmani Lakshmipathy was born in Madras on 6 December 1881. She was the daughter of Srinivasa Rao and Sudamani. She was the Grand-daughter of Rama Rao, Dewan of Travancore. Her father refused to marry her off at an early age and educated her. So she had the benefit of

obtaining both traditional and western education. She was the first woman who completed degree in Madras University. Before entering politics she was busy with social work and social reform. She was a prominent member of Women's Indian Association since its inception. She was very much interested in developing women's education. In 1924 she went to Japan and she enquired about the Western system of education followed there, after coming back to India she insisted that even in India we should follow it. She argued that by then the system of education in India could produce only clerks to make Indians to work under them only as subordinates. She pleaded for the extension of elementary education act and advocated adult education and compulsory female education. She also said that the western culture with all its merits had produced a slave mentality among our youth.

She was also very much interested in involving in the struggle for Indian Independence. She became the member of Indian National Congress in the year 1924, with that until her death in 1951. She became an active Congress woman. In Politics her activities were spread over whole of Tamil Nadu. She attended the tenth International women's suffrage alliance congress at Paris in 1929, as a delegate from India. She utilized this opportunity to travel all over Europe and also to visit England where she used every opportunity to propagate for India. Her social activities were coupled with political activities. She was the secretary of "Bharat Maha Mandal", a social work organization. She established "Youth League" and through it she tried to accelerate public opinion for prohibition of liquor. Being the "Youth League" president she worked for many social reforms.

The Simon Commission reached Madras on 1929. The Congress Leaders S.Satyamurthy, M.K. Bashyam Iyengar, Mrs. Kamala Bai along with Rukmani Lakshmipathy raised the slogan "Simon go back". She actively involved herself in the Vedaranyam Salt Satyagraha in 1930 under the leadership of Rajaji. In this salt satyagraha she got a telegram from her husband, stating that her three year old child was in a serious condition. Initially she denied going back but, because Rama Rao was her only surviving son, being the first son Emton she lost in his second year, she came to Madras. But when she understood that the condition had improved, immediately she went back on the same day. That shows her involvement in thestruggle for freedom[13].

For this service to the Motherland she got the credit of being the first woman imprisoned in context with salt Satyagraha. In 1931, according to Gandhi-Irwin pact she was released. She was also arrested for her active participation in the Civil Disobedient Movement in 1932 and was sentenced to six month's imprisonment. In 1933 she gave up all her jewels to Harijan Welfare Fund. She was the first elected woman in Madras Legislature in 1935. In 1935-1936 she was the vice-president of the Tamil Nadu Congress Committee. In 1937 she was the deputy speaker of the

Madras Legislative Assembly during the first congress ministry and a member of the working committee of the Indian National Congress.

She was also the first woman minister in the Madras presidency. On the eve of Second World War with respect to the difference of opinion with British Government, the Congress Ministry resigned on 29 October 1939 and the members involved themselves in individual satyagraha. With respect to her active involvement in individual satyagraha, she was again imprisoned in the year 1940.101 After the Second World War, she was elected again to the Madras Legislative Assembly and was made the minister of health in the ministry formed by T. Prakasam in 1946. In this time she signed to start the Medical Colleges in Madurai and Gundoor. After Independence she continued to be an M.L.A. till her death on 7 August 1951. She motivated the youth to create a public opinion for the enactment and successful working of social legislation on problems like caste system, child marriage, alcoholism, untouchability, devadasi system etc. So the congress men regarded her with respect and called her "Mummy".

Jothi Venkatachalam

Jothi Venkatachalam became the Minister of Public Health in Rajaji Ministry. She introduced a number of Bills in the Madras State Assembly to take immediate steps to prevent the outbreak of epidemics like cholara, small pox throughout Tamil Nadu.104 She established 12,461 women clubs in Tamil Nadu. These clubs trained the poor and uneducated women with various handloom works such as lace making, embroidery making and spinning. During the budget session of 1961-1962, she dealt at length on prohibition. She was also responsible for initiating a Bill in 1962 to establish Primary Health Centres in South Arcot District. She brought forward a resolution and got it passed in 1962 to establish a committee to review Medical relief work in the State.

She became the Minister in the Cabinet of Mr. Bakthavatsalam, which assumed office on second October 1963. She was the first woman recommended the formation of women police force in Tamil Nadu.108 In 1965 Jothi Venkatachalam ordered to vaccinate all the children in Tamil Nadu with triple vaccine, for the improvement of children's health care. She also established various leprosy disease control centres in Tamil Nadu, and extended by using new medical procedure in Chennai, Kadaloor and Trichy leprosy disease control centres. Her works developed the health condition of women in Tamil Nadu.

Satyavanimuthu

She was born on 15 February 1923. She was an Indian Politician and an influential dalit leader. She was a member of Dravida Munnetra Kazhagam (DMK) since its beginning in 1949.

She was arrested for leading the DMK's protest against the Kula Kalvi Thittam. In 1959 she was the propaganda secretary of the DMK party. She contested assembly election from Perambur and Ulundurpet Constituencies in all assembly elections between 1957 and 1977 and in 1984. She won three times from Perambur constituency as an independent candidate in 1957 election, and as a DMK candidate in 1967, and 1971 elections. She lost the 1962 election from Perambur and 1977 election from Ulundurpet constituency. She served as a minister for Harijan Welfare and Information during C.N. Annadurai administration in Tamil Nadu from 1967 to 1969. She again served as a Harijan Welfare Minister in Karunanidhi administration till 1974. In 1969 she allotted Rs. 15 lakhs for the scholarship for the scheduled castes and scheduled tribes.

Sathyavanimuthu encouraged women for saving money. In this same year she started 200 Children care centres with the help of Tamil Nadu Government.In 1970 she made arrangements for the small saving in all districts. By her motivation in that year Rs. 9.20 lakhs reached government through small savings. In 1972 a special Committee was constituted by the D.M.K. Government to analyse the impact and effect of the Social Welfare activities sponsored by the Government in Tamil Nadu. She was appointed as the Chairman of this High Level Special Committee. On account of her efforts, each district in Tamil Nadu was given a social welfare centre and through these centres Harijan women were given job opportunities and educational facilities[14].

In the year 1973, because of her efforts 508 hostels were established in Tamil Nadu for the improvement of the education for scheduled castes and scheduled tribes. She also worked hard for the development of women's hostel. The ladies who were working in town were benefited by these hostels. In the same year she gave 126000 rupees to 26 fisherman families due to the death occurred when they were catching fishes in deep sea.

The News and Advertising Department of Tamil Nadu took the work, that to give prizes to best films, best hero's and for best heroin's in Tamil cinema. This prize providing plan was introduced by Satyavanimuthu. She resigned her minister post in 1974 and left DMK. She formed Thazhthapattor Munnetra Kazhagam (TMK). The party was merged with AIADMK after it came to power in the 1977 election.119 She served as a Rajya Sabha member as an AIADMK representative between 3 April 1978 to 2 April 1984. She was also the member of the Welfare Committee for Scheduled Castes and Scheduled Tribes, Dowry and Prohibition Amendment Act Committees to the Indian Parliament. As a member, she had given her views to these committees without fear. She died on 11 November 1999. Her mighty works empowered the women's condition in Tamil nadu.

Janaki Ramachandran

She was born to Rajagopal Iyer and Narayani Amma in the town of Vaikom in Kerala State on November 30, 1923. She was a successful actress and starred in more than 25 movies including 'Velaikari' and 'Aiyiram Thalaivangiya Aboorva Chintamani'. She starred opposite M.G. Ramachandran (former Chief Minister of Tamil Nadu) in many films. She also married him.

When M.G.Ramachandran died in 1987, she succeeded him as the Chief Minister of Tamil Nadu and the leader of the AIADMK party. Janaki Ramachandran became Chief Minister in 7 January 1988 to 30 January 1988, but her government lasted only 24 days, the shortest in the history of Tamil Nadu. Her ministry won the vote of confidence of the Tamil Nadu Legislative Assembly in January 1988 but the Central Government under the late Rajiv Gandhi used Article 356 of the Constitution of India to dismiss her government. Her party was defeated in the next election held in 1989.

Janaki Ramachandran gifted her property in Avvai Shanmugam Salai (Lloyds Road) to house the headquarters of the All India Anna Dravida Munneta Kazhagam in 1986. She was the founder chairman of the Satya Educational and Charitable Society, managing many free educational institutions in Tamil Nadu. She died of a cardiac arrest on 19 May 1996.

Lourdammal Simon

She was elected to the Tamil Nadu Legislative Assembly as an Indian national Congress Candidate from Colachel Constituency in Kanyakumari District in 1957 election. She was the minister of Local Administration and Fisheries in the second cabinet of Kamaraj. The first woman minister of the ministry of Local Administration was Lourdammal Simon. Her working period was between 13-04-1957 to 01-03- 1962.126 During this period she introduced City Municipal (Amendment) Bill in 1958 and 1961, Extension of the Term of Office of Municipal Councilors Bill, 1958, and Local Authorities Financial Bill in 1961[15].

In 1961 she was the minister of local administration; she divided Chennai into North Chennai and South Chennai for the administrative purpose. She made many efforts to improve the primary and higher secondary education. In view of the health status of primary school poor students and to the entry of children to the primary schools K.Kamaraj introduced "Mid day meal scheme" with the help of the American company "Care". Lourdammal Simon extended this plan and 14 lakh poor children were benefited.

She made a survey of fishermen and their needs, rehabilitation work for the affected huts

of the fishermen by monsoon. For the improvement of fish catching, Lourdammal Simon started a Research centre at Gulf of Mannar for deep sea fishing under the Indo-Norway plan in 1957. Because of this plan the deep sea fish catching was improved. In the same year she established marine biology centres at Thirisadai, Thoothukudi, Yennoor and in Kanyakumari. She also established the fresh water biology centres at Chennai, Bhavanisakar, Thoothukudi and in Kanyakumari. Lourdammal Simon introduced the new type of boat for the development of fishermen in Tamil Nadu. The name of this boat was called "Popelo" high speed boat.

These boats helped fishermen to go deep sea to capture more fishes. Her works in Local Administration and Fisheries department helped Tamil Nadu to reach high position in India.

Subbulakshmi Jagedeesan

Subbulakshmi Jagedeesan was born on 24 June 1947, at Erode, Tamil Nadu. She was the first woman minister for Handloom and Textile Department. She worked in this department from 07-05-1978 to 17-02-1980. For the improvement of textile workers, Subbulakshmi Jagedeesan established fashion designing centres in many parts of Tamil Nadu. In Madurai city, the fashion designing centre was under the control of Co-optex industry. In 1979, Subbulakshmi Jagedeesan recommended to start again other five centres under the control of Co-optex industry. So production and sales of dresses and dress materials were highly increased.

The "Janatha" dress producing plan was started in Tamil Nadu to provide free sarees to the poor people. According to this plan Subbulakshmi Jagedeesan arranged 15,000 weaving equipments in order to avoid the dropping out of this plan. She also introduced saving and caring plan, the aim of this plan was to develop the weavers in Tamil Nadu. According to this plan 6% of their salary was deducted every month and another 3% was contributed by the government. The amount then accrued was provided with 7% interest. In order to carry out this plan Subbulakshmi Jagedeesan increased the weaver's life insurance money from 500 rupees to 3000 rupees.

In textile industries, dyeing process is very important. In Tamil Nadu the dyeing process is normally carried out in 60 big bundles of threads, but she started 20 big dyeing industries and the process was carried out with 200 big bundles of threads. She was also the minister for Social Welfare, Government of Tamil Nadu.

Her working period in this department was 27 January 1989 to 30 January 1991. In 1989 Tamil Nadu government introduced Moovaloor Ramaamirtham Ammaiyar memory marriage help plan. According to this plan Rs. 1000 was given to poor women for their marriage. But Subbulakshmi

Jagedeesan increased the amount as Rs. 5000.140 In 1989 she also introduced Tharumambal Widow Remarriage Plan.

According to this plan Rs. 5000 was given to the widows who were remarried. Jothi Vengadatchalam introduced the special vitamin food plan for children in 1953, it was called Chief Minister's children's vitamin food plan. Under this plan children below the age of four were provided with the vitamin food. In 1989, Subbulakshmi Jagedeesan changed the name of this plan as Tamil Nadu Government Vitamin Food Plan (Sathunavu). Under this plan egg was the first accessory dish provided to children[16].

In 1989 Subbulakshmi Jagedeesan started an audio library at Chennai with a view to helping the blind handicapped. She opened the education eye of the blind ones by the "Braily" procedure. In 1990 Subbulakshmi Jagedeesan introduced the new plan called "Tholir Munivor Membadu". This plan encouraged the people who had interest to start various businesses and this helped a lot to increase the employment opportunities to Tamil Nadu. Gomathi Sreenivasan, a woman minister of Tamil Nadu ordered to 3% reservation in government jobs for handicapped. But this act came in to success in 1991, when Subbulakshmi Jagedeesan was in a minister post.

J. Jayalalitha

Jayalalitha was born in Melukote, Karnataka on February 24, 1948. Her father was Jayaram mother was Sandhiya. Her early education was at the Elite Bishop Cotton Girls High School in Bangalore and later at the Chuech Park Presentation Convent in Chennai. Jayalalitha entered the movie world as an actress in her early age.146 She has acted in Tamil, Telugu, Kannada, Hindi and Malayalam films. She was trained in classical dance (Bharata Natyam) and Carnatic music from the young age of 4. Jayalalitha's entry into politics was facilitated by her close companionship with M.G. Ramachandran, the late film star, leader of the AIADMK party and Chief Minister of Tamil Nadu. In 1982 she became the member of AIADMK party. At the end of the year 1982 she was appointed as the propaganda secretary of AIADMK party. 1984 to 1989 she became the member of Rajya Sabha. She was made the joint president of the AIADMK party in Rajya Sabha. In June1991 at the age of 43 she became the Chief Minister of Tamil Nadu and up to May 1996 she was in the position[17].

As Chief Minister, in 1991 Jayalalitha introduced total prohibition. The loss of the revenue to the government during 1991-1992 on the abolition of liquor scheme Was estimated to be Rs. 322 crores. She revived the prohibition enforcement wing With 1800 police men. The government had constituted a state level prohibition committee under the chairman ship of the Chief-Minister

with twenty two members to suggest measures for propagating the message of prohibition. It was highly benefited to women section of the society in Tamil Nadu.

She established Tamil Nadu Development Corporation for Industrial Infrastructural development, Tamil Nadu Guidance and Export Promotion Bureau, Foreign Investment Promotion, Co-ordination Cell, Export Promotion Cell, Standing Advisory Committee, Policy Planning Group, Sale Tax Reform Committee, Labour Rehabilitation Fund, Technology Development Fund, Empowered Committees and Minorities Committees. There were 58 public sector undertakings by the Tamil Nadu State Government with a total capital of Rs. 470.71 crores as on 31-03-1991. Jayalalitha introduced the 'Arivoli Iyakkam' which aimed at bringing about hundred per cent literacy in Tamil Nadu in 1995. For this, committees headed by District Collectors in each District were formed. This scheme was divided into three phases. In 1991-1992 the scheme was successfully implemented in seven Districts. In 1992-1993, ten Districts were on the verge of completion. In 1993-1994, five Districts were covered under this scheme. A post literacy programme was introduced to provide feed back to the people benefited by this scheme. Priority was given to Pudukottai and Pasumpon Muthuramalinga Thevar District.

Jayalalitha government introduced a scheme to beautify the Madras city over five years at a cost of Rs. 1250 crores. During the first year a sum of Rs. 250 crores was spent. In the next 4 years the Madras city was improved on par with modern cities abroad with the basic infrastructure needed for economic development.

For the improvement of education, she introduced panchayat schools in 1991- 1992 and allotted Rs. 4 crores. She also introduced MGR Sathunavu Thittam, Free Text Book Scheme, Free Uniforms and Free Bus Pass by which 62.09 lakh students were benefited. For the upliftment of the female students from first standard to fifth standard, she appointed only lady teachers. On 13-01-1992, 27 Primary Schools were uplifted to Middle Schools. From 1991-1992, 21 High Schools were uplifted to Higher Secondary level and 20 Middle Schools were uplifted to High Schools. In Dharmapuri District 7 High Schools were newly established.154 She introduced "Thottil Kulanthai" (Cradle Baby) scheme in Tamil Nadu to stop the female infanticide.155 She brought many changes in the Police department.

She introduced separate police stations for women and it functioned first in Ayiramvilaku, Chennai. This first women police station functioned well so, she started many women police stations in whole of the Tamil Nadu.156 She also introduced women commando force in Tamil Nadu. She gave a good introduction and opportunities to women by the way of women's Self Help

Groups. She struggled for 33% place for women and also appointed women in high positions in Tamil Nadu Government jobs. She completed the new Veeranam water supply scheme for Chennai, Banning lottery tickets and she also introduced water harvesting scheme throughout Tamil Nadu. She was affectionately called by the people as 'Puratchi Thalaivi' (English: Revolutionary Leader) and 'Amma' (English: Mother)[18]. Because of her luxurious life and the lavish marriage of her adopted son Sudhaharan, she began to decline. In 1972 she got Kalaimamani award by the government of Tamil Nadu. In 1991 the University of Madras awarded her the honorary degree of Doctor of Literature. In 1992 Tamil Nadu Dr. MGR University awarded her the honorary degree of Doctor of Science[19]. In 1993 Madurai Kamaraj University awarded the honorary degree of Doctor of Letters. In 2003 Tamil Nadu Agricultural University awarded her the honorary degree of Doctor of Science and the Bharathidasan University, Trichy, awarded her the honorary degree of Doctor of Letters. In 2005 Tamil Nadu Dr.Ambedkar Law University, Chennai, awarded her the honorary degree of Doctor of Laws[20].

Achievements:

The women members also speak like men members in Tamil Nadu Legislative Assembly for the welfare of society. Apart from political parties they speak for the people. In the Tamil Nadu Legislative Assembly the women candidates speak for devadasi system, dowry system, prohibition, women education, women health care, women reservation etc. They give their own opinion and opposition. This opposition came from the women candidates makes the officers to work fast for the people. From 1974 onwards, women ministers have not played any significant or constructive role as played by women ministers during the period 1950-1970[21].

Political participation of women at lower levels is increasing. But political parties do not give political status to women at higher levels on par with men. It is doubtful whether; women are consulted even at the top level in decision making. Experiences prove that women, if given higher assignments and responsible allotment of work, would raise equal to men as exemplified by some women political workers in the recent past[22]. Most of the women's organizations are now becoming more and more concerned with socio-economic programs rather than solve political problems confronting women. As in the past, irrespective of the political parties in power in the State, women's organizations must continue to take interest in political activities, so that the political status of women may improve[23]..

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PERSPECTIVES ON THE INTERNATIONAL CRITERIA OF UNIVERSITY RANKING SYSTEMS AND STATURE OF INDIAN UNIVERSITY EDUCATION AND RANKING

Dr. S. Prabu Shankar

University is the apex body of educational system. University rankings play a pivotal role in establishing criteria comparability in terms of the comprehensive academic quality, performance and facilities. The increase in the number of university ranking systems especially the variety of methods, criteria and indicators used by these systems demand the development of an index that can measure a university's performance in all aspects (Wildavsky, 2010). University rankings are rankings of institutions in higher education schematized by considering various factors. In addition to ranking the whole of the university systems and institutions certain organizations perform rankings of specific programmes, courses, departments orvarious schools of a university. The ranking systems considerably evaluate almost all criteria of an institution's academic, administrative and infrastructural set up; but there is a wide difference in the criteria of measures when it comes to world university ranking systems namely,

- Academic Ranking of World Universities (ARWU) known as Shanghai Rankings.
- Center for World University Rankings
- Global University Ranking
- G-Factor (G-factor is an indicator of the popularity of each university's website from the combined perspectives of other institutions.
- Professional Ranking of World Universities
- Quacquarelli Symonds (QS) Ranking Methods
- QS Asian University Rankings

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- QS Latin American University Rankings
- QS BRICS University Rankings (BRICS countries – Brazil, Russia, India, China and South Africa)
- QS Stars (this service is separate from QS ranking but to look at a range of functions which mark out a Modern University)
- Times Higher Education (THE) World University Rankings.
- International Ranking Expert Group (IREG)
- Higher Education World University Rankings
- University Ranking by Academic Performance (URAP)
- U.S. News & World Report's Best Global Universities Rankings
- National ranking system
- New Global Ranking of World Universities.
- Global ranking system
- Webometrics Ranking of World Universities (WRWU) (ranking carried out by Cybermetrics Lab (CCHS) a unit of Spanish National Research Council (CSIC).

University Rankings or ranking surveys are widely conducted by reputed magazines, international and national newspapers, websites, government agencies, academic agencies or researchers to comparatively review and represent the phenomena of quality in the existing scenario of University systems. The idea for the world ranking of universities was credited in Ben Wildavsky's (1999) book, The Great Brain Race: How Global Universities are reshaping the World, to then-editor of Times Higher Education (THE), John O'Leary.

Ranking of world universities consider combinations of measures of academic quality, curricular activities, infrastructural facilities, students career oriented skill development and placement, research excellence, and other criteria. Some rankingsystems evaluate institutions within a single country, while others assess institutions worldwide. The concept of University ranking system has produced much debate about rankings' purpose, usefulness reliability and accuracy. The expanding diversity in rating methodologies and accompanying criticisms of each indicate the lack of consensus in the field (Altbach, 2004).

Major Criteria of few internationally acclaimed University ranking systems

Quacquarelli Symonds(QS) World university rankings are annual university rankings.

The six major criteria of QS world university ranking involves,

a) Academic peer review (is an opinion survey which is a survey among active academicians across the world about the top universities in field they know about).

b) Faculty student ratio

c) Citations per faculty

d) Recruiter review

e) International orientation and

f) Aggregation

Quacquarelli Symonds stars

QSstars is a separate service from QS world university rankings. This involves a detailed look at a range of functions which mark out a modern university. Here the rating is represented by the symbol *(star). The universities ranked may get anywhere from one star to five star. The rating of five star plus is for the exceptionally good.

The eight criteria of QS stars involves,

a) Research Quality

b) Teaching Quality

c) Graduate employability

d) University infrastructure

e) Internationalization

f) Innovation and knowledge transfer

g) Third mission activity, measuring areas of social and civic engagement

h) Special criteria for specific subjects

Academic Ranking of World Universities (ARWU)

ARWU system of ranking is being funded by Chinese government to measure the gap between Chinese and 'world class' universities. The ranking system is being compiled and maintained by Shanghai ranking consultancy.

The major criteria of Academic Ranking of World Universities

a) Number of articles published in the 'Nature' or 'Science' Journal

b) Number of Nobel Prize Winners and Field medalists

c) Research indicators

d) Faculty or Alumni who have won Nobel Prizes

e) Quality of teaching

f) Quality of Humanities

Centre for World University Rankings (CWUR)

This is a Saudi-Arabia based consultancy which ranks world's universities since 2012.

The criteria of ranking by CWUR are as follows

a) Quality of Education

b) Alumni Employment

c) Quality of faculty

d) Number of publications

e) Number of publications in high-quality journals

f) Citations and scientific impact factor

g) Number of patents

Global University Ranking (GUR)

This is a Russian rating agency supported by Russia's academic society. Major criteria of rating are being adapted from Academic Ranking of World Universities, Quacquarelli Symonds and such organizations.

The seven indicators of ranking by GUR are

a) Academic Performance

b) Research Performance

c) Faculty expertise

d) Resource availability

e) Socially significant activities of graduates

f) International activities

g) International Opinion.

Professional Ranking of World Universities (PRWU)

The major criterion of professional ranking of world universities established in 2007 takes in to consideration of the following:

a) "the efficiency of each university producing leading business professionals"

b) "the number of Chief Executive Officers" among the Fortune Global 500.

United States New Global Ranking of World Universities

New Global ranking of world universities takes in to consideration the following criteria to rank the university systems

a) The level of academic performance

b) The level of research performance

c) The level of the expertise of the faculty

d) The level of availability of resources

e) The level of the international activities

QS BRICS University Rankings (BRICS countries – Brazil, Russia, India, China and South Africa)

BRICS includes two indicators designed to assess universities' international reputation. This is based on major global surveys of academics and employers.

a) A strong international reputation among graduate recruiters

b) International reputation among academics

c) Academic staff

d) Faculty/student ratio

e) Research

f) Research productivity

g) Internationalization

Webometrics

The Webometrics Ranking of World Universities is produced by Cybermetrics Lab (CCHS), a unit of the Spanish National Research Council (CSIC), the main public research body in Spain. It offers information about more than 12,000 universities according to their web presence (an assessment of the scholarly contents, visibility and impact of universities on the web).

The main indicators of ranking includes the following:

a) The volume of the Web contents and the visibility and impact of web publications

b) A wide range of scientific activities appears exclusively on academic websites and is typically overlooked by bibliometric indicators.

c) Webometric indicators measure institutional commitment to Web publication.

Requisite for University Ranking

As a result of globalization of universities, increase in the number of world class universities, private universities which are rising to the global standards in their infrastructure, quality of teaching, their capacity to provide extensively quality education and increasing competition in higher education, university ranking systems become an inevitable process. Besides the demand on information for academic quality, standards of courses, faculty profile, the details of resources available and placement profile led to university ranking systems.

University rankings are expected by the following stakeholders

- Students opting to choose a university, depending on the level of education he/she prefers to join

- Faculty opting for better career, research and academic prospects
- Policy makers, Financial consultants, Government Authorities, Non-Governmental Agencies (NGOs)
- Administrators, Media and Survey Reporters
- Parents, Community and Academic Peers
- National and International authorities
- Companies and Industry to provide placement opportunities
- Ranking consultancies, agencies and organizations etc.

Picture of Higher Education and Ranking in India

Higher Education in India

Universities, deemed universities and institutions of national reputation are largely independent institutions authorized and endorsed by law to design, develop and offer programs which they consider relevant and appropriate for the national needs; the colleges and institutions are expected to be regulated by the Universities with which they are affiliated or associated with. Specifying the wide reach and variety of institutions and programs of higher education, a number of professional, coordinative and regulatory bodies and councils have also been established to ensure balanced and healthy growth of higher education in the country.

The number of Universities has increased 34 times from 20 in 1950 to 677 in 2014. The sector boasts of 45 Central Universities of which 40 are under the purview of Ministry of Human Resource Development, 318 State Universities, 185 State Private universities, 129 Deemed to be Universities, 51 Institutions of National Importance (established under Acts of Parliament) under MHRD (IITs - 16, NITs – 30 and IISERs – 5) and four Institutions (established under various State legislations). The number of colleges has also registered manifold increase of 74 times with just 500 in 1950 growing to 37,204, as on 31st March, 2013.

(Source: http://mhrd.gov.in/university-and-higher-education)

Institutions of India, such as the Indian Institutes of Technology (IITs), Indian Institutes of Management (IIMs), National Institute of Technology (NITs), International Institute of Information Technology (IIIT-H), University of Mumbai and Jawaharlal Nehru University have been globally acclaimed for their standard of education.

Indian Universities in the 2014 QS University Rankings: BRICS

A total of 20 Indian universities are ranked among the BRICS top 200, in the new edition of the QS University Rankings: BRICS. The six highest-ranked are all members of the prestigious Indian Institutes of Technology (IIT) group: the Indian Institute of Technology Delhi (IITD) is 13th, Indian Institute of Technology Bombay (IITB) 15th, Indian Institute of Technology Kanpur (IITK) 16th, Indian Institute of Technology Madras (IITM) 17th, Indian Institute of Technology Kharagpur (IITKGP) 20th and Indian Institute of Technology Roorkee (IITR) 37th – with the close places of the first five in particular reflecting a strong consistency in quality.The University of Delhi and University of Calcutta also both make the BRICS top 50, and a further seven universities in India are within the top 100.

(Source: http://en.wikipedia.org/wiki/Higher_education_in_India#Rankings)

Accreditation

The University Grants Commission Act 1956 explains,

"the right of conferring or granting degrees shall be exercised only by a University established or incorporated by or under a Central Act or a State Act or an Institution deemed to be University or an institution specially empowered by an Act of the Parliament to confer or grant degrees. Thus, any institution which has not been created by an enactment of Parliament or a State Legislature or has not been granted the status of a Deemed to be University is not entitled to award a degree."

National Assessment and Accreditation Council (NAAC)

The National Assessment and Accreditation Council (NAAC) is an autonomous body established by the University Grants Commission (UGC) of India to assess and accredit institutions of higher education in the country. It is an outcome of the recommendations of the National Policy in Education (1986) which laid special emphasis on upholding the quality of higher education in India.

NAAC has identified the following seven criteria to serve as the basis of its assessment procedures

a) Curricular Aspects

b) Teaching-Learning and Evaluation

c) Research, Consultancy and Extension

d) Infrastructure and Learning Resources

e) Student Support and Progression

f) Governance, Leadership and Management

g) Innovations and Best Practices

(Source: http://www.naac.gov.in/criteria_assessment.asp)

The essence of Ranking and Focus on Quality

The major objective of ranking systems is to,

a) provide a clear description of the quality perspectives on the various aspects of a university ora higher education institution

b) present a better viewpoint by taking into credits the facilities and opportunities the universities or institutions provide

c) stabilize its position among the competitors

d) claim the prospects of being most sought after or reputed institution

The various ranking systems provided here have their own criteria of assessment to ensure maximum trustworthiness in ranking. The ranking systems does not only assess and provide ranking of institutions but also helps the universities and institutions to reflect on their own strengths and weaknesses. By undergoing a process of ranking or accreditation an institution comes in terms with the reality of its administration, faculty strength, research, effectiveness of the courses offered, job/market value of the courses, evaluation systemsand altogether has the opportunity of auditing itself both in academics and administration.

Conclusion

The intensity of ranking reflects the true judgemental attitude of the organization or the consultancy or agency that conducts it beyond the many factors such as bias, politicization, commercial aspects, power play and some that stand as major barriers in the ranking system. When a university or an institution is truly ranked the primary outcome of such ranking will be quality, which will be the major factor in ascertaining all the other dimensions that need to be evaluated. Hence ranking systems by and large deliberately attempts to establish the 'Quality Perspective' among universities and higher education institutions. This article attempts to explore the various perspectives on the international criteria of university ranking systems and the stature of Indian higher/university education and ranking.

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A WEIGHTED ROBUST ESTIMATOR OF MULTIVARIATE LOCATION AND SCATTER

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Abstract

Statisticians face increasingly the task of analyzing large and high dimension multivariate data sets. This is due to the advances in computer technology which have facilitated greatly the collection of large data sets and, on the other hand, to the fact that most statistical experiments are multivariate in nature. One of the primary problems encountered in this task is robust estimation of location and scatter. Outliers may hamper the classical multivariate location and scatter estimators and lead to unreliable results. Robust methods reduce or remove the effect of outlying data points and allow the good data to primarily determine the results. Some of the robust alternative to the classical estimators are MCD, MVE, OGK, S, M and MM estimators which are highly robust and is limited to relatively low-dimensional data. In this context the author proposed an estimator which is derived from the concept of S-estimator. The proposed estimator mainly based on the weight function which is based on rank of the mahalonobis distance to the data points. The properties of the proposed estimator are discussed and the efficiency over the existing estimators is carried out by a simulation study with application to discriminant analysis.

Keywords

Robust Estimator – Weight Function - Multivariate Analysis – Simulation Study.

1. Introduction

A fundamental problem in multivariate analysis is to develop robust affine equivariant alternatives to the sample mean vector and sample covariance matrix. The sample mean vector and sample covariance matrix are the maximum likelihood (ML) estimates of the symmetry centre

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(location parameter) $\boldsymbol{\mu}$ and the covariance matrix (scatter parameter) $\sum$ in the multivariate normal model. The multivariate normal distribution is a member in a larger family of elliptically symmetric distributions. They are the most efficient estimators of location and scatter parameters at multivariate normal models. However, these classical location and scatter estimators are extremely very sensitive to unusual observations and susceptible to small perturbations in data.

Several robust estimators of multivariate location and scatter have been proposed since Maronna's pioneering paper on multivariate M-estimation (Marrona 1976). Among others, it is mentioned the minimum volume ellipsoid (MVE) and the minimum covariance determinant (MCD) estimators by Rousseeuw (1984), multivariate S-estimators by Davies (1987) and Lopuhaa (1989), the Stahel–Donoho (S–D) estimator proposed in (Donoho 1982, Stahel 1981) and revisited in Marrona and Yohai (1995), Very efficient, high-breakdown estimator, ô-estimator introduced in Lopuhaa (1991), MM-estimators by Tatsuoka and Tyler (2000) and Orthogonalized Ganedesikan Kettenring (OGK) estimator developed by Maronna and Zamar (2002) derived from Gnanadesikan and Kettenring (1972) and Devlin et al. (1981). A thorough overview of robust multivariate estimation can be found in the article by Maronna and Yohai (1998). All the entrenched robust estimators are used to compute the measure of location and scatter after eliminating/down weights the outliers. Even though, they have good break down point, but poor efficient when considering the higher dimensional data. Still it is a challenging task for researcher to attain the most reliable estimates.

One of the difficulties while computing the robust estimates for multivariate problems is that the final result can depend on the initial estimates. A common implementation of weight function referred as w-estimation, is: (i) calculate some initial estimates of means and covariances; (ii) determine the individual Mahalanobis distances of the observations from these means, relative to the covariance matrix; (iii) calculate weights which are related inversely to the magnitudes of the Mahalanobis distances; and (iv) calculate weighted means and covariances. There are two common forms of weight function: one in which the influence of an observation on the means increases linearly for an observation which belongs to the main body of data, and then remains constant; and the another, in which the influence of an observation is zero for very discrepant observations.

The S estimator proposed by Davies (1987) is mainly based on Tukey biweight function. Rocke (1996) showed that S estimators in high dimensions can be sensitive to outliers even if the breakdown point is set to 50%. Therefore, to improve the efficiency of the S estimator many of the authors changed and/or modified the existing weight function. In this context, a new robust estimator

has been proposed from the base concept of S estimator to estimate the multivariate location and scatter, weight function which is used in this estimator mainly based on the rank of the mahalonobis distance. This weight function was introduced by Hossjer (1994) in context of regression model. This function specifies two types of weight functions (increasing vs non-increasing) which enable us to identify intermediate outliers.

This paper provides the theory and algorithm of the proposed estimator for computing robust multivariate location and scatter from large set of data, in order to get reliable estimates. The accuracy of the proposed algorithm has been studied through discriminant analysis under simulating environment. The discriminant analysis is considered in a prediction context and the performance of the discrimination rules is evaluated by misclassification probabilities obtained by simulation. Overviews of well known methods are explained in the next section. The description of the proposed rank based weighted scale estimator namely, RWS-estimator and their properties are presented in the section 3 and 4 respectively. The performance of proposed RWS-estimator over other estimators has been studied under discriminant analysis in section 5 and the results are summarised in the last section.

2. Robust estimators

Let be a dataset of p-variate observations. Then the general form of calculating weighted mean vector and covariance matrix and respectively, which is given as:

$$\mu = \frac{\sum_{i=1}^{n} w_i x_i}{\sum_{i=1}^{n} w_i}$$

;

$$\Sigma = \frac{\sum_{i=1}^{n} w_i (x_i - \bar{x})(x_i - \bar{x})'}{\sum_{i=1}^{n} w_i}$$

Classical and robust methods differ only assigning weights to the observation based on their own nature. Classical method considered all the points together to compute location and scatter, because there is no particular treatment to each of the observation. So that the value of w_i is considered as unity for all the observations.

Maronna (1976) introduced M-estimators of multivariate location and scatter. The computation of this estimator is accomplished via an iterative scheme that corresponds to a multivariate version of the W-estimator. Roughly, an initial estimate of the mean and covariance matrix is computed, which is taken to be usual mean vector and covariance matrix. Based on this initial estimate, squared Mahalanobis distances were computed. Weights are decreased to zero;

one ensures that outlying observations, those with largest Mahalonabis distances receive smaller weights. Iteration process stops while reaching the final solution, in which the set w_i function gives minimum covariance.

The Minimum Volume Ellipsoid (MVE) estimator was first proposed by Rousseeuw (1984). The estimation seeks to find the ellipsoid of minimum volume that covers a subset of at least *h* data points. Subsets of approximately 50% of the observations are examined in order to find the subset that minimizes the volume occupied by the data. The best subset (smallest volume) is then used to calculate the covariance matrix and the Mahalanobis distances to all the data points. An appropriate cut-off value is then estimated, and the observations with distances that exceed that cut-off are declared to be outliers. To minimize computation time, Rousseeuw and Leroy (1987) proposed a resampling algorithm in which subsamples of *p+1* observation, the minimum to determine an ellipsoid in *p*-dimensional space, are initially drawn.

Rousseeuw (1984) introduced the concept of Minimum Covariance Determinant. It is obtained by finding the half set that gives the minimum value of the determinant of the variance-covariance matrix. Many algorithms have been proposed to simplify the computations and get more efficiency. It can be computed efficiently with the FAST-MCD algorithm of Rousseeuw and Van Driessen (1999). Before that Hawkins (1994) proposed feasible solution algorithm. This makes awareness of MCD in the field of multivariate location and scatter. While the MCD estimator is quite appealing from a theoretical point of view, its practical implementation is rather problematic. Indeed its estimation requires us to compute the determinant of the sample covariance matrix for all subsamples that contain 50% of the initial data.

Using the estimates the location (μ_0) and scatter $(\sum_0)$ obtained by one of the methods, we can calculate the initial robust distance (Rousseeuw and Van Zomeren (1991)).

$$RD_i = \sqrt{(x_i - \mu_0)^t \sum_0^{-1} (x_i - \mu_0)}$$

With these initial robust distances one can define a weight for each observation. The MCD and MVE use a zero-one weight function. That is, at least half the observations get weight one and the remaining data points get weight zero and thus can be treated as outliers. The weight function is defined as

$$w_i = \begin{cases} 1 & if\ RD_i \le \sqrt{\chi^2_{p,0.975}} \\ 0 & otherwise \end{cases}$$

Rousseeuw and Yohai (1984) introduced S-estimator. S-estimators have been proposed as a generalization of the minimum volume ellipsoid procedure. The determinant of the covariance matrix is again minimized, subject to a constraint on the magnitude of the corresponding Mahalanobis distances. The S-estimator can be defined as,

$$\left(\hat{\theta},\hat{\Sigma}\right)=\underset{\theta}{\arg}\min_{\Sigma}\det(\Sigma)\text{, such that }b=\frac{1}{n}\sum_{i=1}^{n}\rho\left(\sqrt{(X_i-\theta)\Sigma^{-1}(X_i-\theta)'}\right)$$

where $b=E[\rho(u)]$.

The parameter $\hat{\theta}$ for which one can find the smallest $\det(\hat{\Sigma})$ satisfying the equality is called as M-estimator of location, while $\hat{\Sigma}$ is a multivariate M-estimator of dispersion. If these parameters are estimated simultaneously they are called S-estimator. From this point, the S-estimators are highly resistant to outliers for an appropriately chosen function ρ. The quality of the S-estimator depends on the function. Here, is considered as Tukey biweight function, which is known to posses good robustness properties. The weight function of M-estimator is defined as

$$\rho(MD_i)=\begin{cases}1-\left[1-\left(\frac{MD_i}{k}\right)^2\right]^3 & if\ |MD_i|<k\\ 1 & if\ |MD_i|\geq k\end{cases}$$

where is mahalanobis distance and k =,

$$\sqrt{p\left\{\sqrt{\left(\frac{1}{9}\right)\left(\frac{2}{p}\right)}c+\left(1-\left(\frac{1}{9}\right)\left(\frac{2}{p}\right)\right)\right\}^3}$$

c is tuning constant.

Maronna's M-estimators are computationally simple but possess a low breakdown point, which is bounded above by 1/(p+1) as shown in Donoho (1982). The MVE has a slow $n^{-1/3}$ rate of convergence (Davies (1992)) and it is hard to compute in high dimensions. The MCD, although $n^{1/2}$ consistent (Butler (1993), Croux and Haesbroeck (1999)), has a very low asymptotic efficiency under normality if one requires high breakdown point. S-estimators defined with a smooth ñ function, also $n^{1/2}$ consistent and can be very efficient under the normal model in high dimensions, but if the function ñ is not properly chosen they can be extremely sensitive to outliers, as pointed out by Rocke (1996). S–D estimators and other robust estimators are robust and reasonably efficient but require a formidable computing time.

3. Rank based Weighted Scale Estimator (RWS-estimator)

This section describes the proposed estimator which is related to Hossjer's rank based weight function instead of Tukey's bi-weight function in the S-estimator namely, RWS-estimator. The weight function used here was introduced by Hossjer (1994) which is briefly discussed as follows:

Estimate the mean vector by minimizing a weighted sum of the squared Mahalanobis distances where the weights depend on the ranks of these distances. The mainly interested in weight functions, $a_n(i) = h^+(i/n+1), i = 1,...,n$ where $h^+ : (0,1) \to [0,\infty)$ such that $\sup\{u; h^+(u) > 0\} = 1-\alpha$, with $0 \le \alpha \le \frac{1}{2}$ and $h^+(u) > 0$ for $u \in (0,1-\alpha]$. Hence, a proportion α of the observations are given weight 0, which ensures that to obtain a robust estimator.

The Rank based Weighted Scale (RWS) estimator of multivariate location and covariance is any solution $\left(\hat{\mu}_{RWS}(X_n), \hat{\Sigma}_{RWS}(X_n)\right) = \arg\min\left(\det\hat{\Sigma}\right)$ subject to

$$n^{-1}\sum_{m=1}^{n} a_n\left(\left\{(x_m-\hat{\mu})^t\,\hat{\Sigma}^{-1}(x_m-\hat{\mu})\right\}^{1/2}\right) = b_0 \qquad x_i$$

where a_n is a Hossjer's weight function.

The solution of the above equations can be written as:

$$\hat{\mu} = \frac{\sum_{m=1}^{n} a_n(R_m)x_m}{\sum_{m=1}^{n} a_n(R_m)}, \qquad \hat{\Sigma} = a_{h^+}\frac{\sum_{m=1}^{n} a_n(R_m)(x_m-\hat{\mu})(x_m-\hat{\mu})^t}{\sum_{m=1}^{n} a_n(R_m)}$$

where R_m is rank value of the mahalonabis distance $d_m = \sqrt{(x_m-\hat{\mu})^t\,\hat{\Sigma}^{-1}(x_m-\hat{\mu})}$

a_{h^+} is the consistency factor.

The computational algorithm of the proposed RWS-estimator is as follows:

Step1: Draw a random (p+1) subsets H_0 from X_n and compute the corresponding mean vector and shape matrix.

Step 2: If determinant value of shape matrix is equal to zero, then extend H_0 by adding another random observation and continue adding observation until determinant greater than zero.

Step 3: Compute the Mahalonobis distances based on the above mean vector and shape matrix for all the observations in X_n .

Step 4: Assign the rank to the Mahalonobis distance, lower rank for near data point and higher rank for the distanced one.

Step 5: Compute the weights based on the rank using the above formula. Calculate weighted mean vector, covariance matrix and shape using these weights. $\hat{V} = \frac{\hat{\Sigma}}{\left|\hat{\Sigma}\right|^{1/p}}$

Step 6: Apply the C-step, lowering each time the value of the scale.

Step 7: The final solution reported by the algorithm is and that correspond to the optimum estimates of location and shape of the dataset.

Note that, since there are only a finite number of permutations of the rank vector *R*, there can only be a finite number of weighted means and covariances. Therefore, guarantees that the C-step procedure in Step 6 of the algorithm must converge in a finite number of steps. If the algorithm finds more than one solution, we arbitrarily choose one of the reported solutions of the algorithm as final solution.

4. Properties of RWS-estimator

The robustness properties of the RWS estimator are described in this section. The global robustness is investigated by means of the breakdown point and the local robustness is investigated through the influence function.

4.1 Breakdown Point

The breakdown point of an estimator measures the smallest fraction of observations that need to be replaced by arbitrary values to carry the estimate beyond all bounds. Intuitively, it is clear that the RWS, this will be approximately α because a proportion α of the observations with

largest distances does not affect the estimator. Then k is the number of observations gets a non-zero weight in the RWS estimator. The number of points, k out X_n must lie on the same hyperplane R^p.

Then, for any multivariate dataset X_n satisfying following condition

$$\varepsilon_n^*(\hat{\mu}_{RWS}, X_n) = \varepsilon_n^*(\hat{\Sigma}_{RWS}, X_n) = \frac{\min(n-k+1, k-k(X_n))}{n}$$

with the maximal number of observations of X_n lying on the same hyperplane of R^p.

Since k= [(1-á)(n+1)] for data sets in general position, the breakdown point tends to min (1-á,á).

4.2 Influence Function

The influence function of an estimator measures the infinitesimal effect of point contamination on the estimator. It is defined at X_n, hence it requires the functional form of the estimator T, which maps any distribution H on a value T(H) in the parameter space. For multivariate location, this parameter space is R^p, whereas for multivariate scatter estimators the parameter space corresponds with the positive definite matrices of size p. The influence function of the estimator T at the distribution H in X_n is defined as:

$$IF(X_n; T, H) = \lim_{\varepsilon \downarrow 0} \frac{T(H_{\varepsilon, X_n}) - T(H)}{\varepsilon}$$

with $H_{\varepsilon, X_n} = (1-\varepsilon)H + \varepsilon \Delta_{X_n}$ a contaminated distribution with point mass in X_n.

The influence function of the mean vector and scatter matrix for RWS estimator is given by

$$IF(X_n; \mu_{RWS}) = \frac{w(\|X_n\|)x}{-2c_2} I(\|X_n\|^2 \le q_\alpha)$$

$$IF(X_n; \Sigma_{RWS}) = \frac{1}{2c_3} X_n X_n^T w(\|X_n\|^2) I(\|X_n\|^2 \le q_\alpha) + R(\|X_n\| I_p)$$

where c_2 and c_3 are constants, and $q_\alpha = \tilde{G}^{-1}(1-\alpha)$ and $w = h^+ \, o \tilde{G}$.

5. Experimental Study

This section presents the results of the performance of the proposed RWS-estimator over the other most widely used robust estimators under the simulated data. The superiority of the proposed RWS-estimator has been demonstrated by applying in the discriminant analysis in the context of apparent error rate without/with various levels of contaminations.

The performance of the estimators has been studied by simulation. The data sets generated from a variety of settings such as dimensions (p = 3 and 5) and number of groups (2 and 3). All the groups have the same identity covariance matrix (I_p) and different mean vector and the study has performed for various level of contamination (0%, 2%, 5%, 10%, 20%, and 30%). The same study has repeated for the number of observations 50, 100 and 500. In all the cases the class distributions are normal, but generated data sets differ in the shapes of the group population and in the separation between the mean of the groups.

$$G_i \sim N_p(\mu_j, \Sigma_j), \qquad j = 1,2,3$$

The data were generated from the population with the following mean vector and covariance matrix.

$$\mu_1 = (0,0,0);\ \mu_2 = (5,0,0);\ \mu_3 = (0,6,0);\ \Sigma_1 = \Sigma_2 = \Sigma_3 = I_3$$

$$G_i \sim N_p(\mu_j, \Sigma_j),\ j = 1,2$$

Generated data were contaminated with different mean vector $\hat{\mu}_1 = (7,7,7)$, $\hat{\mu}_2 = (-4,-3,-4)$, $\hat{\mu}_3 = (4,3,2)$ and covariance matrix $\hat{\Sigma}_1 = 3 * I_3, \hat{\Sigma}_2 = 7 * I_3, \hat{\Sigma}_3 = 4 * I_3$

Then distributions will be contaminated in the form

$$G_i \sim (1-\varepsilon) N_p(\mu_j, \Sigma_j) + \varepsilon N_p(\hat{\mu}_j, \hat{\Sigma}_j)$$

where ε is level of contamination (0,0.02, 0.05, 0.1, 0.2, 0.3).

Apparent error rate (AER) was considered as measure to know the efficiency of the proposed RWS-estimator and other estimators. First, it is considered the first two populations and then all the three populations $G_i \sim N_p(\mu_j, \Sigma_j), j = 1,2,3$ were considered in the second case. The experimental results in the context of apparent error rate are displayed in the table 1.

Table 1: Apparent error rate under various estimators (p = 3)

	Case 1 (2 groups)						Case 2 (3 groups)					
Method	MLE	MCD	MVE	M	S	RWS	MLE	MCD	MVE	M	S	RWS
Error	$n_1=n_2=50$						$n_1=n_2=n_3=50$					
0.00	0.020	0.020	0.021	0.025	0.025	0.023	0.015	0.023	0.020	0.023	0.021	0.021
0.02	0.050	0.019	0.021	0.022	0.020	0.021	0.047	0.020	0.018	0.015	0.017	0.017
0.05	0.090	0.023	0.020	0.024	0.021	0.023	0.067	0.021	0.019	0.019	0.020	0.018
0.10	0.070	0.025	0.023	0.028	0.025	0.026	0.087	0.021	0.021	0.020	0.021	0.020
0.20	0.070	0.025	0.027	0.027	0.028	0.027	0.147	0.025	0.023	0.023	0.023	0.025
0.30	0.090	0.029	0.031	0.030	0.033	0.029	0.160	0.022	0.025	0.023	0.028	0.026
	$n_1=n_2=100$						$n_1=n_2=n_3=100$					
0.00	0.010	0.015	0.017	0.015	0.018	0.017	0.023	0.028	0.031	0.026	0.030	0.028
0.02	0.030	0.014	0.015	0.010	0.019	0.013	0.037	0.023	0.020	0.019	0.024	0.025
0.05	0.055	0.023	0.018	0.013	0.020	0.015	0.067	0.025	0.023	0.021	0.028	0.024
0.10	0.075	0.025	0.020	0.018	0.025	0.019	0.090	0.029	0.030	0.024	0.030	0.027
0.20	0.120	0.025	0.021	0.020	0.028	0.019	0.166	0.026	0.032	0.029	0.032	0.030
0.30	0.125	0.029	0.023	0.022	0.031	0.020	0.220	0.031	0.035	0.030	0.036	0.030
	$n_1=n_2=500$						$n_1=n_2=n_3=500$					
0.00	0.007	0.018	0.020	0.017	0.021	0.020	0.025	0.032	0.030	0.035	0.028	0.030
0.02	0.035	0.018	0.019	0.018	0.017	0.019	0.031	0.025	0.022	0.028	0.026	0.025
0.05	0.047	0.020	0.021	0.020	0.019	0.021	0.059	0.024	0.027	0.028	0.028	0.025
0.10	0.067	0.023	0.021	0.021	0.023	0.021	0.083	0.028	0.029	0.030	0.032	0.029
0.20	0.103	0.022	0.025	0.021	0.024	0.024	0.138	0.035	0.031	0.036	0.034	0.030
0.30	0.130	0.025	0.024	0.025	0.027	0.026	0.194	0.040	0.035	0.039	0.038	0.033

Table 2: Apparent error rate under various estimators (p = 5)

	Case 1(g = 2)						Case 2 (g =3)					
Method	MLE	MCD	MVE	M	S	RWS	MLE	MCD	MVE	M	S	RWS
Error	$n_1=n_2=50$						$n_1=n_2=n_3=50$					
0.00	0.030	0.035	0.029	0.033	0.036	0.033	0.020	0.023	0.022	0.026	0.028	0.025
0.02	0.050	0.037	0.032	0.031	0.036	0.035	0.033	0.025	0.022	0.027	0.028	0.027
0.05	0.060	0.037	0.033	0.033	0.037	0.035	0.047	0.027	0.024	0.029	0.029	0.029
0.10	0.080	0.039	0.035	0.036	0.039	0.038	0.073	0.031	0.027	0.032	0.032	0.031
0.20	0.090	0.040	0.039	0.038	0.042	0.040	0.080	0.031	0.029	0.033	0.035	0.033
0.30	0.100	0.044	0.041	0.041	0.045	0.043	0.080	0.034	0.031	0.035	0.036	0.035
	$n_1=n_2=100$						$n_1=n_2=n_3=100$					
0.00	0.030	0.034	0.030	0.034	0.035	0.034	0.023	0.029	0.030	0.030	0.027	0.028
0.02	0.040	0.036	0.032	0.035	0.038	0.035	0.043	0.030	0.030	0.032	0.029	0.029
0.05	0.070	0.036	0.033	0.036	0.039	0.037	0.057	0.033	0.032	0.033	0.033	0.031
0.10	0.065	0.038	0.035	0.038	0.041	0.038	0.073	0.037	0.036	0.037	0.038	0.036
0.20	0.080	0.040	0.037	0.038	0.042	0.040	0.078	0.040	0.041	0.041	0.040	0.038
0.30	0.100	0.041	0.039	0.041	0.045	0.042	0.091	0.042	0.045	0.044	0.044	0.041
	$n_1=n_2=500$						$n_1=n_2=n_3=500$					
0.00	0.024	0.030	0.024	0.029	0.029	0.027	0.014	0.027	0.024	0.028	0.025	0.025
0.02	0.038	0.031	0.026	0.031	0.030	0.029	0.029	0.028	0.026	0.029	0.028	0.028
0.05	0.054	0.033	0.027	0.031	0.032	0.031	0.044	0.031	0.027	0.031	0.030	0.028
0.10	0.071	0.037	0.030	0.036	0.035	0.034	0.056	0.035	0.030	0.033	0.034	0.031
0.20	0.085	0.039	0.036	0.038	0.036	0.035	0.069	0.037	0.036	0.037	0.039	0.035
0.30	0.088`	0.040	0.042	0.040	0.042	0.039	0.087	0.041	0.040	0.041	0.044	0.037

Similar to 3 dimensional datasets, 5 dimensional data were considered with following mean vector and covariance matrix

$$\mu_1 == (0,0,0,0,0);\ \mu_2 = (0,4,0,0,0);\ \mu_3 = (0,0,9,0,0);\ \Sigma_1 = \Sigma_2 = \Sigma_3 = I_5$$

Generated data were contaminated with different mean vector $\hat{\mu}_1 = (5,4,3,2,1)$, $\hat{\mu}_2 = (-4,-2,-3,-7,-1)$, $\hat{\mu}_3 = (7,8,7,8,7)$ and covariance matrix $\hat{\Sigma}_1 = 3 * I_5$, $\hat{\Sigma}_2 = 7 * I_5$, $\hat{\Sigma}_3 = 4 * I_5$. The experimental results in the context of apparent error rate are displayed in the table 2.

It is observed from the results that all the methods including the proposed method shows the error rate are almost same, while considering the data without contamination. The contamination level increases, AER produced by the classical method increases rapidly over the other robust estimators. The proposed RWS-estimator produces AER similar to MVE and MCD and also in some cases it is lesser than others. It is concluded that the RWS-estimator is equally efficient and in some cases more efficient than the other robust estimators.

6. Conclusion

In this paper, a robust procedure has been proposed to estimate the location vector and covariance matrix. The theory and computational algorithm of the proposed RWS-estimator have been discussed. The properties like breakdown point and influence function also studied. The superiority of the proposed estimator has been demonstrated by successfully applied into discriminant analysis with simulated environment along with various levels of contamination over the other robust estimators such as MCD, MVE, M and S by measuring the AER. It is suggested that the RWS-estimator may be applied to wherever the location and scatter are used, in turn to get more reliable result even if the data with/without contaminated (noise).

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