Indian J Physiol Pharmacol 2010; 54 (1) : 5–20

REVIEW ARTICLE

HOMOSEXUALITY : A DILEMMA IN DISCOURSE !

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(Received on October 1, 2009)

Abstract : Homosexuality has been in practice even prior to its recorded history. In the Indian cultural context, discourse on sexuality had never gained an agreeable consensus from any platform. However, in the recent past, efforts were made by governmental and nongovernmental organizations to bring sex-related issues to the masses after speculation on presumably the fast spread of AIDS (acquired immuno-deficiency syndrome) particularly through illegal homosexual activities. Nevertheless, strong cultural and religious ideologies discouraged any valid discussions on homosexuality. In light of the given scenario, the present essay aimed to highlight several aspects of homosexuality that include a brief history, biological basis, effect of nature versus nurture, evolutionary perspective and related issues concerning general well-being and health.

Key words : homosexuality heterosexual AIDS

INTRODUCTION

Homosexuality has been a feature of human culture since its earliest history, however, the term ‘homosexual’ was first coined in 1869 by Karl-Maria Kertbeny to describe same-sex attraction and sexual behavior in humans. Kertbeny had anonymously published a pamphlet entitled paragraph 143 of the Prussian Penal Code of 14 April 1851 and its reaffirmation as paragraph 152 in the proposed Penal Code for the Norddeutscher Bund, an open and professional correspondence to Royal Prussian Minister of Justice, in an attempt to oppose the anti-sodomy law (1). The term homosexual was employed as part of a broader system for the classification of sexual types at a time when expressions such as same sex attraction disorder, an inverse sexual orientation or even mental illness were applied indiscriminately.

In general, homosexuality as a sexual orientation refers to an enduring pattern of or disposition to experience sexual, affectional, or romantic attractions primarily to people of the same sex. It also refers to an individual’s sense of personal and social identity based on those attractions, behaviors expressing them, and membership in a community of others who share them. It is

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a condition in which one is attracted and drawn to his/her own gender, which is evidenced by the erotic and emotional involvement with members of his/ her own sex. There is a definite disinterest in the emotional, sexual, and physical engagement with members of the opposite sex. It is easily distinguished from other components of sexuality including biological sex, gender identity (the psychological sense of being male or female), and the social gender role (adherence to cultural norms for feminine and masculine behavior).

Homosexuality has now emerged as an uninvited issue of polemics in the Indian social context. In general, the matters relating to sexuality were never encouraged for open discussion in the civil and government networks. In the past, the prevalent legal provisions as well as cultural and religious underpinnings were the major guiding factors for condemnation of homosexuality at large. The biological perspective was never taken into account, and comprehensive psychoanalysis was almost overlooked at the time of formulation of Indian by-laws on homosexuality in 1860 (Footnote 1). Nonetheless, since it pertains to an emerging concern of the public health domain, it was thought appropriate to make an unbiased analysis of various aspects of homosexuality ranging from a brief history, its causes - if innate or acquired, evolution, the cross-cultural scenario, legal and health perspectives. The objective of this essay is to provide a comprehensive and critical analysis of available scientific information in order to make a clear understanding on the biological basis of homosexuality. It is believed that such scientific discourse shall benefit the society, the judicial system and the policy maker at large in reaching to the roots of a genuine social cause in the current evolving egalitarian society.

Historical perspectives of psychosexual concepts regarding homosexuality

In most ancient cultures, religion and local laws had played a major role in guiding and advocating approval or disapproval of homosexuality in various contexts. In ancient Greece, certain forms of erotic attraction and sexual pleasure between males were accepted as part of the cultural norms, and the socially significant form of close same-sex sexual relations between adult men and adolescent boys was known as pederasty (2). In cultures under Abrahamic religions, the law and the church established sodomy as a transgression against divine law or a crime against nature (cultures) with a provision of severe punishment (3, 4). In some tribes in New Guinea, there is practice of homosexuality wherein young boys (8–15 years) are inseminated by the adult male warriors (5). In Crete, every adolescent boy has to undergo a homosexual relationship as a rite of passage into manhood (5). In these two instances, though homosexuality is accepted but it appeared an enforced social convention and is not a natural expression. Hindu religious texts such as *Rig Veda* (1550 BC) elaborate on sexual practices, and sculptures of India's ancient temples depict explicit homosexual acts. The ancient Hindu

Footnote 1: Chapter XVI, Section 377 of the Indian Penal Code (Unnatural offences) was introduced during British rule of India to criminalize homosexual activity. It was drafted in 1860 by Lord Macaulay as a part of the colonial project of regulating and controlling the British- and Indian-origin subjects. It says 'Whoever voluntarily has carnal intercourse against the order of nature with any man, woman or animal, shall be punished with imprisonment for life, or with imprisonment of either description for term which may extend to ten years, and shall also be liable to fine'.

text *Kama Sutra* describes homosexuality more vividly than any other ancient texts (6). Nonetheless, the oldest text on code of conduct listed in the *Manu Smriti* has prescribed restriction of homosexuality through punishment (7, 8).

Within medicine and psychiatry, homosexuality was not universally viewed as a disorder but a different view began to predominate judging such behavior as indicative of a person with a defined and relatively stable sexual orientation. Richard von Kraft-Ebing elaborated the concept in his book 'Psychopathia Sexualis' in the form of a medico-forensic study in 1886 (9). British physician Havelock Ellis published similar views in his influential book 'Sexual Inversion' in 1897 that homosexuality was not a disease or crime (10). These medical texts were not widely accessible to the general public thereby a Magnus Hirschfeld's Scientific Humanitarium Committee was constituted that campaigned against anti-sodomy laws from 1897 to 1933 in Germany. Magnus Hirschfeld was one of the pioneering sexologist who began his career in medicine but was drawn to the study of human sexuality. Hirschfeld's intention was to move homosexuality from the arena of illness to a natural condition. His famous book 'The Homosexuality of Men and Women' was designed to provide a unified, comprehensive description of homosexuality which would clear heterosexuals of homophobic prejudice and allow homosexuals to accept themselves and stop feeling isolated (11).

Sigmund Freud and Havelock Ellis also affirmed their viewpoints on homosexuality. Ellis (1901) argued that homosexuality was inborn and therefore not immoral, that it was not a disease, and that many homosexuals made outstanding contributions to society (10). He also disagreed that homosexuality could be cured or corrected by psychoanalysis. Freud's basic theory of human sexuality was different from that of Ellis. He felt that all human beings were innately bisexual, and that they become heterosexual or homosexual as a result of their experiences with parents and others (12). Nevertheless, Freud agreed with Ellis that a homosexual orientation should not be viewed as a form of pathology. However, the later psychoanalysts did not follow this view. Sandor Rado (1940, 1949) rejected Freud's assumption of inherent bisexuality, arguing that heterosexuality is inborn and that homosexuality is a phobic response to members of the other sex (13, 14). Other analysts later argued that homosexuality resulted from pathological family relationships during the oedipal period (around 4–5 years of age) (Footnote 2) and claimed that they observed these patterns in their homosexual patients (15). Charles Socarides (1968) speculated that the etiology of homosexuality was pre-oedipal and, therefore, even more pathological than had been suggested by earlier analysts (16).

Although psychoanalytic theories of homosexuality have had considerable influence in psychiatry, they have not been subjected to rigorous empirical testing. Instead, they have been based on analyst's clinical observations of patients already known by them to be homosexual. The major flaw in these analytical procedures were, first, double blind procedure was not used in clinical psychoanalytic studies of

Footnote 2 : Oedipal period – In psychoanalysis, a stage in the psychosexual development of the child, characterized by erotic attachment to the parent of the opposite sex, repressed because of fear of the parent of same sex, usually occurring between the ages of 3 and 6 years.

homosexuality therefore, the analyst's theoretical orientations, expectations, and personal attitudes were likely to bias her or his observations (17). Another problem with psychoanalytic studies was that the examined subjects were only those homosexuals who were already under psychiatric treatment or therapy. Such patients either on their volition or straying from cultural norms, however, are probably not representative of well-adjusted individuals in the general population.

In the course of the 20th Century, homosexuality became a subject of considerable study and debate in western societies. It was predominantly viewed as a disorder or mental illness. At that time emerged two major pioneering studies on homosexuality carried out by Alfred Charles Kinsey (1930) and Evelyn Hooker (1957). A zoologist and taxonomist, Kinsey (Indiana University, USA) conducted the research on human sexuality to find out how many adults were engaged in homosexual behavior. This empirical study of sexual behavior among American adults revealed that a significant number of participants were homosexuals (18, 19). In this study when people were asked directly if they had engaged in homosexual sexual relations, response of a large percent of the population was negative. However, when asked if they had engaged in same-sex sexual relations, the percentage of positive responses nearly doubled. The results of this study became the widely popularized Kinsey Scale of Sexuality. This scale rates all individuals on a spectrum of sexuality, ranging from 100% heterosexual to 100% homosexual. While establishing that as many as 10% of adult males and 2–6% the females reported having sexual relations with a same-sex partner, the impact of this study did little more than to adopt the term homosexuality in parlance.

Evelyn Hooker obtained a grant from the National Institute of Mental Health to explore the relationship between homosexuality and psychological development and mental illness. The psychological tests were executed on both homosexuals and heterosexuals to evaluate difference in their psychological adjustment. She recruited a sample of homosexual men who were functioning normally in society rather than studying psychiatric patients. Both groups were matched for age, intelligence quotient and education level, and were then subjected to three psychological tests, the Rorschach, Thematic Apperception Test and the Make-A-Picture-Story Test. Experts were asked to rate men without giving prior knowledge of their sexual orientation. Blinded to each subject's sexual orientation, two independent Rorschach experts evaluated their overall adjustment using a 5-point scale. There were no significant differences between the two cohorts in any of these tests (20, 21). Hooker concluded from her data that homosexuality as a clinical entity did not exist and that it was not inherently associated with psychopathology. She changed the landscape of this sexual behavior from one of pathology to a normal type of sexual behavior in the minds of academicians.

As a result of Hooker's finding, the American Psychiatric Association (APA) deleted homosexuality from its Diagnostic and Statistical Manual of Psychological Disorders (DSM) in 1973 and released a public statement that homosexuality was not a mental disorder (22). The APA finally stated in 1994 that homosexuality is neither a mental illness nor a moral depravity. It is the way a portion of the human population expresses their love and sexuality (23).

Most psychoanalytic theories stress the role of parental and family dynamics, not the society as a whole. Behaviorists believe that some sexual and gender identification differences result from roles imposed by family and friends upon children, such as the masculine and the feminine stereotypes. However, there is no evidence, social or biological, to support that homosexual children were raised differently from the heterosexual children. Besides, with reinforcement of gender identification norms, one would be led to logically deduce that all the stereotype reinforcement would serve to ensure a heterosexual behavior.

Theories on the cause of homosexuality: biological basis

To find out the putative role of nature or nurture, as a causative factor, a number of studies were initiated to explore the biological basis of homosexuality. Biological theorists from time to time have supported their contentions based on the anatomical, neuroendocrine evidences and genetic studies. More recently, the neuroimaging techniques are also employed to explore the neural correlates of homosexuality.

Anatomical evidence

In the central nervous system various areas that are involved in reproduction are sexually dimorphic. These areas include the medial preoptic area, the sexually dimorphic nucleus of the preoptic area (SDN-POA), the medial amygdala, the suprachiasmatic nucleus (SCN), the ventromedial hypothalamic nucleus, the ventral region of the premammillary nucleus, the accessory olfactory bulb, the bed nucleus of the accessory olfactory tract, the bed nucleus of the stria terminalis (BNST) and a few regions in cortex (24–29). The neural circuits in these areas of brain attain either of one of two opposite morphological patterns i.e. predominant male or female type. The SCN, a structure involved in the regulation of circadian rhythms and reproductive cycles, is elongated in females and more spherical in males (26). The mean volume of the SDN-POA is 2.2 times larger in males than in females and contained about twice as many cells (28). The function of this sexually dimorphic area in humans is not known, but presumably it is involved in the control of male sexual behavior. The volume of the BNST is 2.5 times greater in males than in females (27). Women have larger gray matter in the orbitofrontal cortex involving Brodmann's areas 10, 11 and 25 and temporomedial cortex (bilateral hippocampus and right amygdala), and their left basal insular cortex (24). In contrast, men show a higher gray matter concentration in the left entorhinal cortex (Brodmann's area 28), right ventral pallidum, dorsal left insular cortex and a region of the orbitofrontal cortex (Brodmann's area 25). The gender differences in corpus callosum are inconclusive (30-33). According to a few reports, the males possessed a larger genu and the average thickness of corpus callosum was greater in the female splenium (30–32). These reports clearly describe prevalent structural differences between the sexes in the brains of human and many vertebrate species. The following text attempts to examine if such difference also exists between homo- and heterosexual brain.

Dick F. Swaab was the first to document a difference in the anatomical structure of a homosexual man's brain based on his noteworthy experiment reported in 1990. A postmortem examination of homosexual male brains revealed that a portion of the hypothalamus of the brain was structurally

different than a heterosexual brain (34). Laura S. Alien found that the anterior commissure was significantly larger in the homosexual men than that of the heterosexuals (35). These two anatomical findings became a standing ground for the biological argument on homosexuality. The size difference would emerge due to sexual differentiation occurring during the prenatal period and not due to environmental factors.

Simon LeVay (1991) focused on the hypothalamus to test the biological substrate of sexual orientation. LeVay did a post-mortem examination on human brains of patients who had died from AIDS-related illnesses. It is stated that these consisted of 19 declared homosexual men, 16 presumed heterosexual men, and 6 presumed heterosexual women. LeVay discovered that within the hypothalamus, the third interstitial nucleus of the anterior hypothalamus (INAH3) was smaller in homosexual men then in heterosexual men (36). It was concluded that the homosexual and heterosexual men differ in the central neuronal mechanisms that control sexual behavior, and that this difference in anatomy was no product of upbringing or environment, but rather prenatal cerebral development and structural differentiation. LeVay later stated in his biography that the INAH3 may not be the only centre in the brain influencing the sexual behavior in men and women (37).

Neuroendocrine basis

Another line of investigation which supported the biological basis was neuroendocrine studies. The study of Gunter Dorner, an East German scientist, has been used as reference to understand how the brain is patterned for gender during fetal development in rats. Dorner classified homosexuality as a central nervous pseudohermaphroditism implying that male homosexuals to have brains with the ‘mating centres’ of women in the body of men. The neuroendocrine viewpoint in his basic hypothesis was that the sexual orientation is determined by the early levels (probably prenatal) of androgen on relevant neural structures. If highly exposed to these androgens, the fetus becomes masculinized. The adult female rats that received male-typical levels of androgens sufficiently early in development exhibited male symptoms of attraction. The same was true in the reverse when applied to the male subjects. Thus, the female rat exposed to high levels of male hormone exhibited high levels of aggression and sexual drive toward other females, eventually trying to mount the other females in an act of reproduction. All those male rats that received deficient levels of androgen became submissive in matters of sexual drive and reproduction, and were willing to receive the sexual act of the other male rat (38). Dorner believed that the structure of the brain is built, step by step, into a female or a male pattern of sexual identity and behaviors. This happens through the development of three centers: The sex centre (controls typical male or female characteristics), the mating centre (control sexual behavior), and the gender-role center (controls behaviors such as aggression) that become fully expressed under the hormonal influence of puberty. Swaab had drawn similar conclusions that the human gender identity and sexual orientation are programmed into our brain structures during the intrauterine period (39). These investigators advocated the strong belief that social environment after birth has no major effect on gender identity or sexual orientation.

Dorner then tested his hypothesis in the

human population by closely examining the history of the homosexuals who were born before, during and after World War II. He found that significantly large numbers of homosexuals were born during the stressful war and early post-war period than in the years before and some time after the war. The mothers of two-thirds of these homosexuals reported experience of severe to moderate maternal stress during their pre-natal life with factors such as bereavement, bombings, rape or severe anxiety. On the other hand, none of the mothers of the heterosexual men in a control sample had been the victim of severe stress, and experienced only occasional moderate stress. However, Schmidt and Clement (1995) failed to replicate Dorner's finding that war-induced stress in pregnant women caused a drop in fetal androgen levels which in turn leads to the development of a homosexual orientation (40, 41). They also found that even in those cities that suffered the most severe bombing during World War II, there was no evidence of increased numbers of homosexuals negating Dorner's theory (41). But later, a few reports supported Dorner's hypothesis that stressed pregnant women have a greater chance of giving birth to a homosexual daughter (42) or homosexual son (43, 44).

Milton Diamond, an American scientist, had a parallel line of thought to Dorner on development of sexuality, but believed that four stages were involved: Stage 1 – basic sexual patterning (passivity or aggressiveness), Stage 2 – sexual identity (the gender mindset adoption), Stage 3 – sexual object choice (similar to Dorner's mating centre) and Stage 4 – control over sexual equipment (including the mechanism of orgasm) (45). Dorner and Diamond believed that if something goes wrong during the development of each or any of these stages, there may be aberration in the gender patterning (for what our culture defines as typical masculine or feminine characteristics and sexual expression). When the plasma testosterone levels were assessed in homosexual women and age-matched heterosexual women in a study, it was found that though the levels overlapped considerably, averaged concentration was 38% higher in homosexual than in heterosexual subjects (46). However, these results could not be replicated by other investigators (47).

Interestingly, sexually-deviant behavior occurs more frequently in males as male brains must undergo a more complex hormonal processing to change them from the initial female brain pattern and so there is more chance for error. An extreme example of this would be the so-called accidents of nature wherein a female patterned brain appears to reside in a body with external male genitalia and vice versa.

Genetics

The most preliminary approach, yet a powerful technique were to probe twins to identify the mechanism underlying homosexuality employing the principles of genetics. To tease out the influences of genetic and environmental factors on psychological and behavioral traits, comparison of the probability of homosexuality between monozygotic (or identical) twins (MZ), who possess exactly the same genes as the co-twin, and dizygotic (or fraternal) twins (DZ), who are not closely related genetically to any normal sibling but roughly half of their genes are the same, was done. If there is a difference between the concordance rate for homosexuality in MZ and DZ, then this is strong evidence that

there is some genetic component to the etiology of homosexuality. However, if the concordance rate in monozygotic twins is not 100%, then environmental factors must be exerting some influence.

Franz J Kallman conducted the earliest twin study in 1952 and reported a 100% concordance between MZ twins, and only a 12% concordance for DZ twins (48, 49). Although the theory was discredited with methodological problems, it paved the way for further studies. Michael J. Bailey and Richard Pillard (1991) studied the homosexuality between MZ, DZ twins, and non-related adopted brothers. They examined how many of the sample population were homosexual and how many were heterosexual. They found that 52% of MZ twins, whereas 22% of DZ twins and only 5% of non-related adopted brothers were self-identified homosexuals (50). This experiment was repeated and results were similar proving that the more closely genetically linked a pair is, the more likely that both will exhibit homosexual or heterosexual tendencies. Later they also found occurrence of homosexuality among sisters in 48% of MZ twins of homosexual women, 16% of DZ twins and 6% of adoptive sisters (51).

The role of genetics in male sexual orientation was further investigated by Dean Hamer in a pedigree and linkage analyses on 114 families of homosexual men (52). To investigate a maternal link, the family trees of declared homosexual men were examined. He took DNA samples from forty homosexual men, and genetically examined them to explore the possibility of homosexuality being an X-linked trait (female sex linked). It was found that there was a remarkable concordance for 5 genetic markers on an arm of the X-Chromosome called Xq28 (53). Hamer hypothesized that male homosexuality could stem from the maternal lineage, and the startling discovery of Xq28, led to his findings being dubbed as the ‘gay gene study’. The statistical probability of the 5 genetic markers on Xq28 to have matched randomly was calculated to be 1/100,000, lending even more support to his findings.

Later, it was asserted by Satinover that no scientific evidence showed that homosexuality was directly inherited in the way eye color is inherited as per Mendelian Principles (54). His comment on the ‘gay gene’ was that there is a genetic component to homosexuality, but this component is just a loose way of indicating genetic associations and linkages. Linkage and association do not mean causation. There is no evidence that proves that homosexuality is genetic and none of the research so far lays such claim.

One of the most recent research shows evidence of the genetic switch that can turn homosexuality on and off in fruit flies (55). Fruit fly *(Drosophila melanogaster)* is a favorite research model in the genetic studies. David E. Featherstone focused on a glial amino-acid transporter called *genderblind,* in which a mutation caused male flies to court males with the same probability as females (55). By manipulating this gene, homosexuality in flies could be altered. These investigators reported a non-neuronal mechanism for modulation of the neuronal function in the brain as *genderblind* is a glial transporter. There is a caveat in the explanation and comparison of homosexuality qualitatively across the species. It is to be conjectured whether a part of such research findings can indeed be extrapolated beyond flies as human behavior is a lot more complex.

Neuroimaging studies

There is evidence to suggest that the brains of homosexual men function differently than the brains of heterosexual men (56-59). The studies comparing the homosexual, heterosexual men and women have indicated that homosexual men are more like women in their intellectual functions and different than heterosexual men (56-59). They have superior verbal abilities compared to heterosexual men (57, 60). More recently, neuroimaging techniques have been used to facilitate our understanding in the neural mechanism of sexual orientation in homosexuals (61–67). Even till now, phallometry (Footnote 3) was considered gold standard in assessment of sexual orientation (68), but this measurement had been criticized because of its intrusiveness and limited reliability (69). The functional magnetic resonance imaging (fMRI) is a non-invasive technique in which the differential spatial activation of the brain is revealed by a change in blood oxygen level-dependent signals. Various sexual arousal paradigms are used to predict the difference in neural circuits involved in homo and heterosexual brain (61–67). Positron emission tomography (PET) imaging involves injection of a radioactive tracer (a biological molecule which carries a positron emitting isotope). Within minutes, the molecule accumulates in an area of the body for which it has an affinity and the emitted positrons are detected. PET imaging is used to evaluate the functional connectivity in the brain (63). The results from these imaging modalities show activations of right cingulate cortex, the left angular gyrus, left caudate nucleus, and right pallidum in homosexual men, but not in heterosexual men during visually evoked sexual arousal (61, 62). However, heterosexual men showed activation in the bilateral lingual gyrus, right hippocampus, and right parahippocampal gyrus, areas not activated in homosexual men. In another report, it was shown that in the homosexual men and heterosexual women volumes of the cerebral hemispheres were symmetrical whereas in homosexual women and heterosexual men there was a rightward cerebral asymmetry (63). Sex-differentiated functional connections are shown in amygdala at rest. In man, the connections were mainly from right amygdala targeting to sensorimotor cortex, striatum, and pulvinar, whereas in women these are more pronounced in left amygdala and project to subgenual cortex and hypothalamus. But homosexual subjects showed sex-atypical amygdala connections (63).

Cerebral responses to putative pheromones and objects of sexual attraction were also found to differ between homo- and heterosexual subjects (64, 65). Men exhibit much higher levels of genital and subjective arousal to sexual stimuli containing their preferred sex than they do to stimuli containing only the nonpreferred sex. Apparently heterosexual men are not stimulated by a male scent which suggests that pheromones contribute to determining our behavior in relation to our sexual orientation (64). Homosexual women, as compared to heterosexual women, reacted in a sex atypical, almost reciprocal way to pheromones (65). It is known that men show category-specific genital and self-reported specific sexual arousals in response to visual sexual stimuli, and their greatest sexual arousal is to the categories of people with whom they preferred to have sex.

Footnote 3 : Phallometry or penile plethysmograph is a method for assessing sexual arousal/interest among men.

Comparisons of activation to preferred sexual stimuli, nonpreferred sexual stimuli revealed large networks correlated with sexual arousal, spanning multiple cortical and subcortical areas as both homosexual and heterosexual men exhibited category-specific arousal in brain activity (66). Within the amygdala, greater preference-related activation was observed in homosexual men, but it is unclear whether this is a cause or a consequence of their sexuality.

It is known that sexually arousing visual stimuli activates the human reward system and triggers sexual behavior. Ponseti used pictures of either male or female genitals displaying signs of sexual arousal as a sexual stimuli instead of sexually arousing pictures of a person to avoid confounding brain activation related to neuronal processing of faces, gestures or social interactions (67). The fMRI during visual processing of sexual core stimuli pinpointed a neuronal correlate of sexual preference in humans as stimuli lacked any additional contextual information. The ventral striatum and the centromedian thalamus showed a stronger neuronal response to preferred relative to non-preferred stimuli. Likewise, the ventral premotor cortex which is a key structure for imitative (mirror neurons) and tool-related (canonical neurons) actions showed a bilateral sexual preference-specific activation. It was suggested that viewing sexually aroused genitals of the preferred sex triggers action representations of sexual behavior. The neuronal response of the ventral striatum, centromedian thalamus and ventral premotor cortex to preferred sexual stimuli was consistent across all groups. This invariant response pattern in core regions of the human reward and motor system represent a functional endophenotype for sexual orientation independent of the gender of the observer and gender of the stimulus. One line of thought suggests that a male/female dichotomy in behavior develops with age and this development might be under the influence of very different learning experiences as sexual experiences are experiences that are likely to change brain profoundly (70). So there is still a strong possibility that any real differences demonstrated between adult homosexual and heterosexual brains related to sexual functioning could result due to learning and experience.

It is an interesting observation that the homosexual men have an increased prevalence of non-right-handedness and they exhibited atypical patterns of hemispheric functional asymmetry. Non-right-handedness in men is associated with increased size of the corpus callosum, particularly of the isthmus, which is the posterior region of the callosal body connecting parietotemporal cortical regions (71). These results indicate that callosal anatomy and laterality for motor functions are dissociated in homosexual men. Another study indicates that the auditory systems of homosexual and bisexual females, and the brain structures responsible for their sexual orientation are partially masculinized by exposure to high levels of androgens prenatally. The click-evoked otoacoustic emmisions (CEOAEs) are echo-like waveforms emitted by normal-hearing cochleas in response to a brief transient sound. The CEOAEs are stronger in females than in males. Homosexual and bisexual females were intermediate to those of heterosexual male and females. No differences were observed between homosexual and heterosexual males (72).

Homosexuality among animals: an evolutionary perspective

The homosexual behavior has been observed in many animal species. The study

of homosexual activity in diverse species may elucidate the evolutionary origins of such behavior. The use of the term ‘homosexuality’ in the context of animals requires drawing a distinct line between social interactions alone and sexual interactions. The strong cultural implication laid in this term among the human society would be least relevant for other species. The cognitive component in animal sexuality and motivating factors are least understood. In animals, sexual behavior is defined as courtship displays or sexual solicitations, mounting, and any interaction involving genital contact between one animal and another. Bruce Bagemihl (1999) characterized sexual behaviors that include courtship, affection, interactions involving mounting and genital contact, pair bonding and parenting activities (73). Thus, homosexuality in animals conforms to exhibition of copulation, genital stimulation, mating games, and sexual display behavior between individuals of same sex.

Animals which engage in sexual interactions with members of then- own sex are obviously not in immediate pursuit of reproductive goals (conception). This viewpoint highlights paradox for the Darwinian Theory as homosexual behavior might not conform to procreation role of nature (74). Sexual selection is one theory that explains a process of differential reproduction as males vary in their ability to acquire female mates as reproductive partners. Mate acquisition competition could be intra-sexually occurring intra-sexually among males for females and encompasses physical fights and threats as well as ritualized displays of courtship aimed at attracting females or inter-sexually involving females selecting the most attractive male competitor. More recently, sexual coercion has been proposed as an additional mate acquisition mechanism that males can employ if they are unsuccessful at competing for, or attracting, female reproductive partners. Another theory suggests that homosexual behavior in animals serves an adaptive socio-sexual function by which same-sex mounting is a ritualized gesture that individuals used to communicate their dominant relationship and those behaviors which are sexual in form (75). Homosexual behavior in males preserves sexual function, enabling an animal to maintain its reproductive fitness, providing a beneficial stimulation for continued production of seminal fluid and interest in sexual activity. The wild koalas, which are mostly solitary, seem to be strictly heterosexual and their homosexual activity was certainly enhanced in captivity (76). Bonobos, our nearest kin, exhibit homosexuality (77). The homosexual bonding system in bonobos represent the highest frequency of homosexuality known in any species. Japanese macaques (known as snow monkey), lions, penguins and many other species are shown to display homosexuality (73, 78, 79). Homosexuality among some species appears to be far more common in captivity than in the wild. Captivity may bring out homosexual behaviors in part because of a scarcity of opposite-sex mates. Prevalence of homosexual alliance in same-sex settings such as prisons, military camps, hostels and sports teams is a reflection of ‘situational homosexuality’. It is also hypothesized that exclusive male homosexuality has a catastrophic effect on reproduction (80). Sexual impulses like any evolved phenomena may be subverted for other purposes (81).

Other related issues

Medico-legal viewpoint: international status

The APA removed homosexuality from the DSM in 1973, and later declared that it

was not a disorder. Subsequently, a new diagnosis, ego-dystonic homosexuality, was created for the DSM's third edition in 1980. Ego-dystonic homosexuality was indicated by a persistent lack of heterosexual arousal, which the person experienced as interfering with initiation or maintenance of wanted heterosexual relationships, and distress from a sustained pattern of unwanted homosexual arousal. In 1986, this diagnosis was removed entirely from the DSM. The only vestige of ego-dystonic homosexuality in the revised DSM-III occurred under "Sexual Disorders Not Otherwise Specified", which included persistent and marked distress about one's sexual orientation. At this juncture, another widely used listing of mental disorders – the World Health Organization's International Classification of Diseases 9th edition (ICD-9) still included homosexuality as a diagnosis and it was only in 1992 that WHO removed homosexuality from the ICD-10 (23).

The American Bar Association in 1974 approved decriminalization of consensual adult homosexual acts. During the 1980s and 1990s, most developed nations enacted laws decriminalizing homosexual behavior and prohibiting discrimination against homosexuals in employment, housing, and services. In South Asia, Middle East and African countries, homosexuality is still illegal carrying punishment by life imprisonment to the death penalty.

It is reported that quality of life among homosexuals were high in cultures with accepting attitude towards homosexuality than in culture with restricted attitudes (82). A group of Human Rights experts launched Yogyakarta principles on the application of Human Rights Law in relation to Sexual orientation and Gender rights in 2007 (83).

Medico-legal viewpoint: indian provisions

In India, section 377 of the Indian Penal Code (Chapter XVI) was introduced in legislation during British rule to criminalize homosexual activity. It is commonly referred the 'Anti-sodomy Law' (84). After almost 149 years of the formulation of Section 377, the Delhi High Court gave a historical verdict for decriminalization of homosexuality on 2nd July 2009 (85). Apparently, the ambit of section 377 as the anti-sodomy act is the only legal measure to safeguard and protect the dignity of the unprivileged section of society in the Indian context where children and members of weaker section are highly vulnerable to sexual exploitation.

Hidden health hazards associated with homosexuality

Homosexuality has been illegal under Indian law and the prevalent cultural norms obliged the men or women to marry the members of opposite sex only. Thus, a majority of homosexuals are not only married to heterosexual partners but also continue to retain their homosexual alliances in secret (86). One serious ramification has been exposure of the innocent partner to diseases like AIDS and other venereal diseases if the homosexual spouse continues to have multiple sexual links. Though there are no documented records on consequences of these marriages, it is likely that when a homosexual person is obliged to hide his/her sexuality and forced to marry under various social and family pressures, there is high probability of conjugal conflicts leading to upsurge in secondary psychiatric disorders.

The general robust belief is that marriage is in no way comparable to alliance between homosexuals. In some countries there is provision of marriage between same-sex

couple whereas in few others there is provision of a civil union with partial rights of marriage (87).

Deterrents to perception of homosexuality

The age-old cultural and religious endorsements have consistently advocated that homosexuality is wrong both in principle and on ethical grounds, since it pertains to an unnatural act without any valid outcome. Moreover, the bowdlerization of any issue pertaining to sexuality, scientific or social, in the public has only worsened the situation by letting all kinds of misconceptions to spread at the cost of human dignity and health. Even the very idea of sex education is generally ill-perceived in the conservative social framework.

Another major concern comes from the prevailing law that prevented homosexuals to come forward to test for HIV/AIDS. According to estimate of National AIDS Control Organization, NACO, there are 2.5 million male homosexuals in India (88). It is estimated that the number of exclusively or predominately homosexual men in India may be over 50 millions but accurate data is difficult to gather due to the legal barrier (89). Recent reports in India indicate high HIV prevalence among homosexual men (90, 91). The prime fear among the policy makers is that legalization of homosexuality might result in increase in number of AIDS cases. However, there is another angle to it, i.e. if the legalization provides for a mandatory registration of homosexual's, then the homosexual alliance would not only be safe and would also guard against the spread of AIDS in a major way. Freud had stated that "Homosexuality is assuredly no advantage, but it is nothing to be ashamed of, no vice, no degradation, it cannot be classified as an illness; we consider it to be a variation of the sexual function produced by a certain arrest of sexual development. Many highly respectable individuals of ancient and modern times have been homosexuals, several of the greatest men among them (Plato, Michelangelo, Leonardo da Vinci, etc.). It is a great injustice to persecute homosexuality as a crime, and cruelty too...." (92).

Future trends :

Homosexuality has been viewed differently in various cultures. The psychosexual concepts related to it had undergone enormous transformations in last century from a state of mental illness/ disorder to a natural condition. The biological evidence indicates that the human gender identity and sexual orientations are programmed into the brain during the intrauterine period and there is genetic component to homosexuality. A few studies indicate that learning experiences during various stages of development can also influence sexuality. Homosexuality is a more complex issue in human as compared to animals, and the role of nature versus nurture is yet under scanner of scientific investigation. All the studies and evolutionary theories till date individually did provide useful information to some aspects of homosexuality but a more comprehensive and integrated research approach is desired to understand the roots of homosexuality in longitudinal studies.

ACKNOWLEDGEMENTS

The authors greatly thank Prof. V. Mohan Kumar (Sree Chitra Tirunal Institute of Medical Sciences & Technology, Thiruvananthapuram (Kerala) and Dr. Subbulakshmi Natarajan, National Brain Research Centre, Manesar (Haryana) for their critical evaluation and helpful suggestions to this review.

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