

Altered Neurobiochemical Circuitry in Sexual Violence

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ABSTRACT

Sexual violence (SV) has gone rogue globally. Different schools of thought has implicated different parameters with SV. In the current article, neuro-biochemical and neuro-endocrinal discrepancy of the sexual offenders and of sexually harassed persons had been highlighted. Outcomes of the present article would aid in formulating novel strategies against SV and the sexual offenders.

Keywords: Fornication; Molestation; Rape; Extra-Marital Sex; Neuroscience

Abbreviations: MoE: Ministry of Education; JU: Jahangirnagar University; MoST: Ministry of Science and Technology; UGC: University Grants Commission; SV: Sexual Violence; PTSD: Post-Traumatic Stress Disorder; WM: White Matter; WHO: World Health Organization

Introduction

World health organization (WHO) defines sexual violence as “Sexual violence is any sexual act, attempt to obtain a sexual act, or other act directed against a person’s sexuality using coercion, by any person regardless of their relationship to the victim, in any setting. It includes rape, defined as the physically forced or otherwise coerced penetration of the vulva or anus with a penis, other body part or object.” [1]. The person committing sexual violence (SV) is the sex offender [1]. Rate of SV has been soaring alarmingly [2-4]. Globally, about 35% of women had undergone SV and the trend seems to be upward [2-4]. Time is up to formulate strategies to hold back this crisis. In this article, the neurobiochemical alteration of the SV survivor has been discussed.

Amended Neuro-Biochemical Circuitry and Consequences

Compared to the normal subjects, differential neuroanatomy had been observed in the sex offenders [5]. Increased fractional anisotropy in the white matter (WM) of the male rapists had been detected [5]. Anatomical derangement of WM could over-exert the rapists’ desire of sex and coerciveness over the subjects to be raped [5]. The abnormality associated with WM also triggers their excessive pleasure seeking, reward craving and self-motivating approach towards rape

[5]. Aggressive and violent behavior of the rapists also correlate with their modified WM integrity [1]. Compared to the normative subject, abnormality in the gray matter connectivity and integrity, volume of the cortex and brain size had been noticed in the sexual offenders [6]. Structural alteration in the gray matter of the sexually assaulted women had been observed [7]. Decreased volume of the amygdala in the sexually assaulted women also reveal the assault survivors’ post-traumatic stress disorder (PTSD) related alteration [7]. Similar findings had been observed in case of cortex, cerebellum and hippocampus [8-10]. Even, SV leads towards osteopathic abnormalities in the victims [11].

At the onset of SV, the prefrontal cortex associated with reasoning and rational thinking gives in to the automatic defense/fear circuitry [12-15]. Hypothalamus warns the pituitary gland about the danger and in response it triggers the adrenaline gland that secretes adrenaline (catecholamines) and cortisol [12-15]. At the same time, oxytocin produced in the hypothalamus and stored in the posterior pituitary gland, comes into play. Endogenous opioids/opiates (endorphins, enkephalins, dynorphins synthesized from pre-opiomelanocortin) also engage in this concert [12-15]. This “endocrinal storm/flood” reduces energy and leads towards “fight or flight response”. Adrenaline renders “fight or flight response” through constriction of blood vessel, increasing heart pumping to the brain and whole body [12-15]. Cor-

tisol ensures economic utilization of body's energy, lowers digestion and cognitive performance; rather, triggers the full attention towards ongoing/current threat combat [12-15]. Thus, the defense circuitry takes over the whole control of the brain function over others. Consequently, survival reflexes and habit behavior ensue [12-15]. However, sometimes "freezing behavior" may ensue through the reflex action guided by the amygdala. As soon as the amygdala detects a threat response, it signals the brainstem to inhibit movement [12-15]. At the extreme state of freezing behavior, "tonic immobility (unable to move, speak, feeling cool, hyperventilation, tremor)" or "collapsed immobility (decreased blood pressure and heart rate, fainted, paralyzed and even death)" may occur [12-15].

Fear circuitry activation impairs normal encoding process of memory especially because of the hypersensitivity of the amygdala and hippocampus to the "endocrinal storm/flood" [16-18]. As the brain is engaged in "survival anyhow is the best policy at this moment" situation, normal reasoning and memory encoding steps become disrupted, slowed and difficult [16-18]. At that moment, seemingly unimportant scenery or sound or smell might seem important to the nervous system of the survivor [16-18]. This is like the filming of an unwanted scene by the cameraman that the director of the film is not even aware of during filming/shooting an important episode of a film. As a result, the memory formation becomes truncated and fear circuitry fails to completely pin-point the sexual offender/rapist, the offenders' facial description and other features [16-18]. Thus, "associative learning and memory process" becomes replaced with that of "dissociative". Even, hallucination-for the moment might occur. Interestingly, the chronological order of sexual violence may not go parallel with the memory encoding chronology [16-18].

Rather, distraction, gaps and disrupted memory encoding lead towards confusion or truncated-remembrance of the SV situation to the survivor [16-18]. Also, the unconsolidated memory remains as fragile and cannot be consolidated [16-18]. Sometimes, their recalling of memory could involve person or situation that does not correlate with or make any sense of the actual phenomena [16-18]. Later the SV survivor suffers from immense physical and psychological abnormalities including anxiety, depression, insomnia, phobia, hallucination, and dementia and becomes vulnerable to neurodegenerative disorders such as Alzheimer's disease. Now, time is up to take appropriate measure to resist SV and to formulate the strategies and therapeutic approaches against neurobiochemical alteration associated with sexual violence [19-21].

Conclusion

Sexual violence (SV) warrants immediate action. Neuro-biochemical and neuro-endocrinal support to the sexually harassed and sexual offenders would aid in mitigating and withstanding the ever increasing SV worldwide. Thus, policy-makers should consider these facts while formulating strategies against SV.

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