Loneliness and Mental Health: Critical Clinical Issues

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ABSTRACT

Loneliness signifies the adverse feeling resulting from social disconnectedness and the barrier between achieving one’s desired social relations. The present review article primarily examines the interplay between loneliness and mental health. Though the available literature is large the following paper attempts to provide an overview of the various areas where loneliness and mental health are intertwined. The paper examines the basic concept of the construct of loneliness and differentiates it from other similar constructs. Loneliness has pertinent effects on physical health that in turn affect mental health. This is reviewed in a section followed by the effects of loneliness on mental health in general. Genetic factors as well as the neurobiological underpinnings of loneliness are examined. The effects of loneliness across the life span are also discussed with loneliness and its effects across age groups being examined. The factors determining the evolution of loneliness in humans is also examined. Though the paper follows a narrative rather than a systematic review paradigm, it gives the reader an overview of the various facets of loneliness and mental health. The paper also sums up the effect of loneliness on morbidity and mortality while exhorting the need for healthy social relationships in living. Various interventions that may be carried out for the prevention of loneliness are also discussed.

Keywords: Loneliness, mental health, social isolation, neurobiology, elderly, children.

INTRODUCTION

Social networks are important in our lives as each one of us often turns to our family, friends, co-workers and others for support when needed. It is essential to maintain social relationships for individual survival and well-being [1]. However, many individuals are unable to form and maintain these relationships and are plagued with social isolation and loneliness. It is important to understand that the terms ‘social isolation’ and ‘loneliness’ have different meanings [2]. Social isolation refers to a lack of social contact and support while ‘loneliness’ can be termed as adverse feelings due to a deficient social network and an inadequacy for social involvement. It refers to the individual perception associated with the divergence between their anticipated and achieved social relations [3]. Loneliness is the discomfort of social disconnection and the longing for social acceptance and connection. Loneliness has been described as “the subjective, unwelcome feeling of lack or loss of companionship” [4]. It has been divided into two distinct types: emotional loneliness and social loneliness. Emotional loneliness is personal, relating to satisfaction with existing opportunities to socialise while social loneliness is where people feel they do not have a wide social network, with support from friends or allies in times of distress [5]. Loneliness is often
confused with social engagement, with the belief that getting people more involved in their communities or building up social networks will alleviate the problem. However, people who are fully engaged with their communities and have a wide social network can also feel lonely, while people who live on their own in isolation from society may never feel lonely [6]. The quality of social relationships plays an important role in whether or not people suffer from loneliness, as does their own life experience. Loneliness has far reaching ramifications as far as physical and mental health is concerned [7]. The current paper reviews the various areas where loneliness and mental health are linked providing an overview of the field.

**METHOD OF CONDUCTING THIS REVIEW**

For identifying articles that focused on loneliness and mental health, the terms ‘loneliness’, ‘loneliness and mental health’, ‘neurobiology of loneliness’, ‘genetics of loneliness’, ‘loneliness and old age’, ‘loneliness in children and adolescents’ or ‘social isolation’ were used. For identifying articles that focused on specific terms, words like ‘anxiety’, ‘anxiety disorder’, ‘depression’, ‘health related quality of life’, ‘physical health’, ‘medical illness’, ‘evolution’, ‘psychosocial interventions’ and other like terms were used. These two search strategy results were combined with an ‘and’ statement in the following data bases with the time frame being specified from 2000 through 2016. The databases used were Medline, Pubmed, Scopus and the Cochrane Database on Systematic Reviews. In total, 278 articles were identified which included reviews, mini reviews, research papers and randomized studies in populations with loneliness or at a risk of social isolation. Most of the papers were clinical research and many review papers both narrative and systematic were identified.

We included studies with sample sizes of more than 50 participants (where needed in the discussion). Most of the reviews were read by all the authors and key papers were identified for inclusion in this paper. The papers reviewed in this article include original research articles, reviews and intervention studies. This is supplemented with the personal clinical experience of all the authors in this field who work regularly with this group of patients who experience loneliness. All the authors are psychiatrists working in a tertiary hospital and medical college in Mumbai where loneliness is commonly reported in the psychopathological evaluation of patients.

**LONELINESS AND PHYSICAL HEALTH – IMPLICATIONS FOR MENTAL HEALTH**

The physiological systems of individuals that are lonely take up more impact of the stressors confronted in daily lives and are unable to moderate stress responses when compared to individuals who have supportive social ties [8]. Studies have shown that lonely individuals undergo high levels of stress and reported perceiving their daily chores to be more stressful and threatening than compared to non-lonely individuals [9]. It can be seen that blood pressure differed between lonely and non-lonely individuals where lonely individuals were depicted by high peripheral resistance (TPR) and lower cardiac output [10]. Five-year cross-lagged analyses in middle aged and older adults revealed increases in systolic blood pressure (SBP) due to loneliness 2, 3 and 4 years later with more increases in SBP being linked with greater initial levels of loneliness [11]. Peripheral resistance plays an important role in order to determine blood pressure over the years. Chronic cardio-vascular diseases stem from elevated blood pressure and these facts suggest that the deficiencies in perceived social bonds is related to differences in physiological functioning and could cause serious health consequences [12]. Loneliness has also been linked to accelerated physiological aging and a faster deterioration of the body’s physiological systems as in response to chronic stress [13]. Smoking, another factor related to cardiovascular morbidity has been linked to loneliness and many studies report that lonely individuals tend to smoke more than individuals with good social support [14]. Other cardiovascular physiological changes like increased arterial stiffness, decreased release of nitric oxide by endothelial cells, enhanced responsiveness of the vascular endothelium to endothelial constrictive factors and oxidative stress has been documented in response to loneliness [15]. Loneliness may also lead to poor lifestyle causing dietary disturbances, poor sleep and obesity that in turn may trigger physical disease [16]. It is well known that various lifestyle diseases and cardiovascular illnesses have in turn implications for mental health as well [17].
EFFECTS OF LONELINESS ON COGNITIVE FUNCTION

Loneliness is known to cause a multitude of cognitive effects. First, loneliness increases explicit attention to social stimuli and increases implicit attention to social threats which is further confirmed via functional MRI studies [18]. Lonely people are viewed more negatively in terms of their psychosocial functioning and in terms of their interpersonal attraction or acceptance than are non-lonely people [19]. Using a modified emotional Stroop task, lonely participants, relative to non-lonely participants, showed greater Stroop interference specifically for negative social relative to negative non-social words [20]. There have been differences in the pattern of regional brain activation produced by lonely and non-lonely individuals when thinking about people. Activation of the visual cortex to the presentation of unpleasant social, in contrast to nonsocial, pictures was directly related to the loneliness of the participant, indicative of greater visual attention to the negative social stimuli [21]. These results are consistent with the behavioral data indicating that loneliness is related to an attentional bias for negative social stimuli [22].

Loneliness has yet another cognitive consequence. It diminishes self-regulation. Poorer self-regulation when feeling isolated is not limited to attention control. In cross-sectional and longitudinal research, lonely individuals have been found to have lower odds of engaging in regular exercise than non-lonely individuals, and the poorer emotional regulation of individuals when they felt lonely mediated the effect [23]. A perceived future of social isolation causes impairment in higher order cognitive and self-regulatory processes that are characteristic of executive functioning. A brain scan conducted while participants performed moderately difficult math problems revealed that the brains of the socially isolated participants were less active in the areas involved in the “executive control” of attention [24].

Loneliness is also a major risk factor for cognitive decline and dementia [25]. In the mental ability situations studied over years, after controlling for various important variables such as age, years of education etc, findings suggested that loneliness was linked with alterations in IQ [26]. In addition, a longitudinal study where cognition was measured over 1, 5 and 10 years suggested that loneliness predicted cognitive decline [27]. When dementia free individuals were studied for cognitive skills such as different types of memories, the findings suggested a negative correlation between the level of loneliness and cognitive performance, positive correlation between loneliness and cognitive decline and some individuals even developed dementia [28]. These studies illustrate that feelings of loneliness can impact cognition in different ways either as consequence or as a predictor [29]. The exact relationship between cognition and loneliness is not well understood. One possibility is such that deficiencies in cognitive functioning may lead to social disconnectedness; poorer social interactions and promote withdrawal that may result in an individual feeling lonely [30]. It is essential to address and carry out additional studies to understand the causality and the mechanism behind the association between cognitive defects and loneliness.

LONELINESS AND MENTAL HEALTH

Social isolation and loneliness has been associated with persistent mental illness and has a strong relationship and influence on the psychological well being of individuals. It has roots in determining symptoms of depression [31] and is also associated with psychosis and schizophrenia [32]. Interpersonal aspects such as social support, social acceptance, and social divergence have been linked to depression [33]. Loneliness when experienced by humans may manifest as depressive symptoms. There are discrepancies in understanding the causal nature of the relation between loneliness and depressive symptoms. It has been shown that the two often co-occur and that when measures of both loneliness and depression were manipulated amongst patients at points in intervals, the two were correlated [34]. Higher levels of loneliness are related to increase in depressive symptoms. When lonely and non-lonely individuals are compared, the lonely individual exhibit increased levels of depressed mood [35]. In a longitudinal study, the casual nature of the two was examined addressing psychosocial variables such as
perceived stress, social support, social network size etc where it was seen that loneliness was yet again associated with more depressive symptoms over a period of 3 years. It was discovered that there are reciprocal influences overtime between the two [36]. The reasoning behind social isolation and depression could be such that loneliness may threaten feelings of personal worth due to the perceived incapability’s of an individual and result in not being able to manage the pain and feelings of disability that comes along with it which may lead to depressive symptoms [37].

Alzheimer’s dementia is one of the commonest causes of dementia worldwide and has been linked to loneliness. A follow-up study revealed that when lonely individuals were compared to non-lonely individuals, they had more than double the chance of developing Alzheimer’s disease even when all the variables of social isolation were controlled. Initially, loneliness showed poor cognition and at the follow-up there was cognitive decline [38].

In addition, the struggle to form interpersonal relationships and diminished social support is commonly found in individuals experiencing psychosis or schizophrenia [39]. These features of psychosis tend to abide by the feelings experienced by lonely individuals. It is seen that symptoms of psychosis is related to less fulfillment of social support and loneliness and it is also studied that this association between loneliness and psychosis could be reduced when anxiety is controlled as it could be one of the leading ways through which loneliness affects psychosis [40]. Lonely individuals have been reported to have an increased tendency to develop a mental illness when all factors otherwise are controlled [41].

Loneliness has also been associated with sleep fragmentation. Loneliness heightens the attentiveness to social threat, which in turn may affect sleep. While sleep efficiency was studied in lonely and non-lonely individuals it is seen that loneliness was associated to greater micro-awakenings and reduced restful sleep [42]. A study wherein adults were tested for sleep efficiency, by the use of a Nightcap in order to record their sleep showed that lonely adults exhibited poorer sleep efficiency and the wake time onset after sleep was greater when compared to non-lonely adults [43]. Furthermore, it has been seen that self report measures of sleep quality like the Pittsburgh Sleep Quality Inventory revealed poor sleep quality, greater perceived sleep duration, and daytime dysfunction in lonely individuals than non-lonely individuals [44]. Compromised sleep and poor sleep quality may be linked to various health outcomes such as increased cardiovascular morbidity, impaired mental health as well as impaired cognitive skills and the individual may be less efficient due to the daytime dysfunction [45].

**GENETICS AND LONELINESS**

Loneliness has been reported to be heritable and genetic in nature. In a study where 22 monozygotic and 40 dizygotic twins were compared to assess loneliness by the means of 16-item scale, the heritability estimate was 55% and 48% respectively, which showed that there is a genetic contribution to loneliness [46]. Candidate gene research concentrates on the genes for loneliness in association with neurotransmitters. The neurotransmitter responsible for social behavior is oxytocin [47]. Individuals who have GG phenotype at SNPs in the oxytocin receptor gene exhibit more sociability and trust in others. In studying the gene effects, it is seen that the individuals with the GG phenotype in the OXTR gene had significantly less chances of being lonely [48]. Loneliness is known to be significantly heritable, with genes playing a role in susceptibility to environmental stressors, as has been seen with other psychiatric illnesses as well [49]. Other genes that have been implicated are MTFHR, CHRNA4, BDNF, and the serotonin transporter gene. Phenotypic variants of the BDNF gene show a gender difference as boys with the Val/Val type of BDNF rs62625 and girls with the Met/Met type are found to be lonelier. The short allele of the serotonin transporter gene is associated with the inefficient dampening of negative emotions [49].

**NEUROBIOLOGY AND LONELINESS**

The neurobiology of loneliness has been explored largely by means of animal studies. The areas of the human brain posited to be associated with loneliness are the prefrontal cortex,
temporoparietal junction, visual cortex, hippocampus, amygdala and striatum [50]. It has been found that the social isolation of animals is associated with altered levels of various neurotrophic factors and neurohormones such as brain-derived neurotrophic factor (BDNF), nerve growth factor (NGF), corticosterone, GABA and allopregnanolone [51]. It has been hypothesized that fluoxetine may mitigate the behavioral effects of loneliness via allopregnanolone rather than serotonin, as allopregnanolone facilitates GABA and upregulates BDNF [52]. Social isolation is also associated with reduced proliferation, differentiation and ongoing myelination of the nerve cells, especially in the prefrontal cortex [53]. Environmental stimulation has also been linked to brain volume and information processing capacity, as per the social brain hypothesis. Conversely, increased sociability may lead to faster and fuller recovery following neural injury such as from cerebral ischemia, and may protect against cognitive decline [54]. As per the evolutionary theory, loneliness is an important aversive stimulus that promotes social interaction [55]. However, constant stress may take a toll on the body’s capacity for homeostasis [56]. The primary mediators of the aversive neuroendocrinological impact of the stress and social isolation are hypothalamic-pituitary adrenocortical (HPA) axis and the sympathetic autonomic nervous system [57]. Social support confers greater resilience and better physiological control of the aforementioned two systems. From animal studies, sociability appears to be mediated primarily by oxytocin and vasopressin [58]. Dysregulation of the HPA axis also contributes to hypertension, atherosclerosis and coronary artery disease via intravascular inflammation [59]. Loneliness is also associated with elevated urinary and salivary cortisol and this appears to be specifically related to hypervigilance, negative social evaluation and a feeling of lack of control [60].

Loneliness also has an array of consequences on the immune system [61]. Natural killer cell activity, one of the defenses against cancer, has been found to be compromised in a study conducted in lonely medical students [62]. The response of inflammatory cytokines such as interleukin-1 (IL-1) and tumor necrosis factor (TNF) to lymphocytes is also compromised in lonely individuals [63]. Loneliness also appears to adversely impact wound healing time [64]. Studies have also shown that chronic over activation of the HPA axis, particularly in relation to loneliness, is associated with glucocorticoid resistance and a complimentary gene in pro-inflammatory gene expression, which contribute to ill-health and morbidity [65].

**LONELINESS IN CHILDREN AND ADOLESCENTS**

Chronic feelings of loneliness develop during the attachment process in early childhood and tend to significantly impact personality and behavior in later life. Children as young as five to six years of age are able to understand the basic concept of loneliness and can be assessed for the same [66]. Childhood loneliness is also commonly associated with severe psychiatric syndromes like depression, borderline personality disorder and schizophrenia in later life [67]. Peer relations play an important role in the development of loneliness in children [68]. Researchers have described two kinds of lonely children - rejected (or disliked) and neglected (neither liked nor disliked), with a greater degree of loneliness seen in the rejected subtype, especially those who were rejected for being submissive rather than overbearing. They also found that maintaining even a single friendship helped mitigate the degree of loneliness in these children [69]. Biologically, volume changes are seen in the ventral striatum, hippocampus, amygdala, anterior cingulate cortex and orbitofrontal cortex secondary to childhood adversity [70]. It has been found that right-hemisphere dominance leads to more trait negative-affectivity; rejected children with this trait therefore have a compounded likelihood of experiencing loneliness [71]. Trait shyness and right hemisphere dominance predispose to a greater likelihood of the child suffering internalizing problems. Further, negative affectivity leads to a negative impression on others, pushing away potential companions and perpetuating the cycle [72].

In keeping with the above mention of the interaction between environmental stressors and a genetic predisposition to loneliness, it has been found that social support can have a modifying effect on the risk posed by maltreatment in genetically predisposed children [73]. Training children in social skills has also been found to ameliorate loneliness and increase acceptance by peers in older studies, but recent interventional research in this regard is lacking [74]. Adolescence is especially a
time of social and personal change, which can aggravate feelings of loneliness. Not surprisingly, loneliness is widespread among adolescents [75]. Loneliness is a product of the interactions between state and trait i.e. between the environment and the individual. Lonely adolescents share certain characteristics such as attributing failure to personal character rather than circumstances, attributing success more to circumstances, feeling a lack of control over their own successes and failures, having fewer friends and the decreased likelihood of having a romantic partner [76]. These findings are supported by another, older study, which additionally found that adolescent loneliness was positively related to social anxiety and negatively related to self-reported attractiveness, likability, happiness, and life satisfaction. The same study reports that adolescents most often attributed loneliness to boredom and commonly turned to television or music to cope with it [77]. Culture plays a role; although adolescent loneliness is pervasive across all races and cultures, the perception of the same has been shown to vary with differing cultural backgrounds [78].

**LONELINESS AND AGEING**

Ageing is a biological process that is influenced by numerous factors and characterised by multiple changes in human body, but is not under anyone’s control [79]. In most developed countries, beginning of old age is marked by the age of retirement (60-65 years). While people at all ages are susceptible to loneliness, it is particularly acute and common in the elderly [80]. This is on account of multiple reasons, such as loss of financial independence post retirement, social isolation (bereavement due to loss of life partner and friends), and disability due to physical constraints [81]. The elderly typically face a dual problem of social isolation and loneliness. Studies have shown that around 10-43% of elderly experience social isolation and 5-16% report loneliness [82]. Continued increase in life expectancy, driven by continuous improvement in medical facilities and disposable income of individuals, has led to further increase in the incidence of loneliness [83].

Loneliness particularly impacts cognition in the elderly. It leads to dementia and Alzheimer’s disease. Studies have shown that loneliness impacts all the 3 components of memory viz. semantic, working and episodic, along with the speed of processing [84]. Besides cognition, loneliness also affects the physical health of the elderly. Studies have shown that with increasing age, there is a rise in systolic blood pressure in lonely people. This increases the risk of cardiac disease and also affects the amount of urine epinephrine levels [85]. In addition to the above, there are multiple psychological effects of loneliness in the elderly. These include low self-esteem, anxiety, depression, restlessness, sleep disorders, alcohol abuse, suicidal behaviour, feeling helplessness and threat, behavioural withdrawal, sense of emptiness, shyness, negative emotions, impaired quality of life, disability, etc [86].

There are many alternatives to treat loneliness in the elderly. One is to increase their social interactions by participating in group interventions with them. Additionally, peer support activities like art and drama, same age friendship networks, religious and educational activities, and voluntary work like gardening, are also helpful. Teaching elderly people new technology such as internet and skype can also be helpful, since these have the potential to reduce their social isolation [87]. Further, one can work towards ensuring that the elderly have adequate income to support their lifestyle. Alternatives here include providing them options to invest in pension schemes, allowing them to work even after retirement, organizing classes aimed at the elderly to improve their educational status, or providing them access to social service. Educating them to make life adjustments such as, lowering their expectations and acceptances is also typically helpful [88].

**INTERVENTIONS TO REDUCE LONELINESS**

If loneliness persists for a long time, it can cause both physical and mental health problems1. Thus, management of loneliness needs to be done at the earliest. Various interventions that can help mitigate loneliness are as follows –

- **Improving Social Skills** – This intervention was earlier practiced to reduce shyness and anxiety among patients but was observed to be effective in treating loneliness. The focus of this intervention is to improve conversational skills urging the subject to speak on telephone, give and
receive complements, handle periods of silence, and introduce non-verbal communication methods and approaches to physical fantasy. Support groups are very helpful in imparting social skills training [89].

- **Enhancing Social Support**: Studies have shown that providing social support helps people whose social network has been disrupted by various factors, such as relocation especially in the elderly, death of a loved one/bereaved or in children with divorced parents. Mutual help groups help increase social support especially in patients with psychiatric illness [90].

- **Increasing opportunities of social contact/interaction**: This intervention mainly addresses people with social isolation. Studies have been done on elderly individuals living in a hotel where a blood pressure programme was conducted in the hotel lobby. This led to increased interaction over time in the lobby despite the subjects' physical disabilities [91].

- **Addressing social cognition**: This is the most important and the most successful intervention for reducing loneliness. Here, the focus is primarily on Cognitive Behaviour Therapy (CBT). Subjects are taught to identify their negative thoughts, and regard them as hypotheses to be tested. Self-help groups are helpful in replacing the negative and fearful thinking with positive and self-supportive thinking [92].

Various interventions have been documented across studies aimed at reducing loneliness. These interventions are classified under four broad categories: [93]

- a. Group Activities such as teleconferencing, support groups, and friendship enrichment training, which were also designed to improve social interaction and social skills.
- b. One-to-one Activities like telephone based and gatekeeper programs to enhance social interaction and social support.
- c. Service provision focussed on social interactions
- d. Whole community approach

**CONCLUSIONS**

Human being is a social animal. 80% of his waking hours is spent with other human being i.e. friends, family members and colleagues at work. Human social behavior has evolved over the ages and also involves positive neural and biochemical changes with it. Failure to socialize and the development of loneliness may have detrimental neurobiological and psychological consequences. A variety of medical and psychological disorders have been linked with loneliness as a risk factor. Loneliness is seen across the life span and across both sexes. Loneliness whether in children or in the elderly has negative consequences both short term and long term. Interventions aimed at reducing loneliness while thereby alleviating the burden of physical and mental illness need to designed as with increase in time there is bound to be a rise in the number of individuals that manifest with loneliness as a risk factor.

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