Adolescent Depression Aetiology

Abstract:

Background: Evidence suggests that depression in adolescents have increased over the last decade, so much so, at its current rate it will be an epidemic in young people. Therefore the aim of this paper is to explore the multifaceted aetiology of depression by examining its biological, environmental, sociological and psychological factors, in order to address and tackle this public health issue now and into the future. **Methods:** A review of the literature was undertaken between the years 2010-2015 to identify key themes and priority areas of development. **Results:** Adolescence signals the beginning of a transformative phase for young people, in which physical, emotional, social and intellectual development occurs in preparation for adulthood. Therefore the exposure to a range of environmental and sociological factors, in addition to pre-existing biological and cognitive vulnerabilities may considerably increase the risk of adolescents developing depression, which is most significant in adolescent girls. **Conclusion:** This review identifies distinctive male and female trajectories during adolescence, particularly in relation to brain development. Therefore further research is required within this area in order to educate young people, parents/carers and professionals working within universal services on the complexity of this subject in order to promote the early identification of depression in adolescents.

Key words: Aetiology, Adolescent, Depression, Major Depressive Disorder.

1. Introduction:

Adolescence marks the beginning of a metamorphic phase of physical, emotional, social and intellectual development. Due to the complexity of this transition, heightened mental health problems such as depression have been associated with this developmental stage (Loftus, Kelly and Mustillo 2011). Over the last decade there has been a paradigm shift in the mental health of children and young people which has resulted in it becoming a current key public health issue. Depression is an emotional disorder which is characterised by a person suffering from low mood, which is episodic in nature, and is also accompanied by a range of cognitive and vegetative symptoms (Bettge *et al*; 2008). Recent figures state there is an estimated 80,000 children and young people suffering from severe depression (Green *et al*; 2005: xxi). This prompts an important question, “what has changed so dramatically over the last ten years which has resulted in young people being susceptible to depression, and also has the potential to impact upon their development into adulthood”? Therefore this paper will explore the multifaceted aetiology of depression by examining a range of risk pathways (Colmon *et al;* 2014) associated with the following factors: biological, sociological, psychological and environmental. In order to understand and recognise the development of this disorder, which will assist in addressing and tackling this epidemic now and into the future.

2. Method

2.1: Data Sources:

A systematic review of the literature was undertaken using the following search terms: *Aetiology [All Fields] AND ("depressive disorder"[MeSH Terms] OR ("depressive"[All Fields] AND "disorder"[All Fields]) OR "depressive disorder"[All Fields] OR "depression"[All Fields] OR "depression"[MeSH Terms]) adolescent.* These search terms were inputted into the following electronic databases: ScienceDirect, EBSCOhost, SocINDEX, MEDline, PsycArticles, AMED, JSTOR and CINAHL. The publication dates were set between 2010 – 2015, the reason for this was to review literature following the introduction of a public health based approach to mental health (Department of Health, DH 2011). Hand searches were

also completed on Google Scholar and Pubmed for articles with the above search terms which resulted in 14,476 articles being identified for further analysis.

2.2: Inclusion/Exclusion Criteria:

Articles were included in this review if they met the following criteria: ***a***) worldwide, ***b)*** systematic review, meta-analysis, longitudinal or cross-sectional design, MRI studies, case control studies, ***c)*** publication in a peer review article/document/guidelines, ***d***) Female and Male adolescents aged between 12-19 years, ***e)*** depression, ***f)*** specifically based upon aetiology – biological, sociological, environmental and psychological causes. Articles were excluded from this study if they were ***1***) outside the year range 2010-2015, ***2)*** published in other languages other than English, ***3)*** editorial and anecdotes, ***4)*** articles reviewing other mental health conditions other than depression we excluded from selection. This resulted in 14, 437 being excluded from the study and 39 articles requiring full text assessment.

2.3: Data Selection:

Following a comprehensive review of the 39 articles this resulted in just 27 articles remaining which were from a range of countries such as United Kingdom, United States, New Zealand, Germany, China, Australia and India, as well as being undertaken by researchers from a selection of specialisms such as psychiatry, neuroscience, health, education and psychology.

3. Results:

3.1: Biological Factors:

Beardslee *et al;* (2011) indicates depression runs in families, with offspring of depressed parents being between 2-4 times most likely to develop this disorder than children from homes without parental illness. Therefore initially we must consider development of this disorder from birth, by asking the following question 'are some adolescents genetically predisposed to developing depression'? The 5–HTTLPR gene is a key central nervous system neurotransmitter which is essential in serotonin uptake to nerve cells thus clearly is linked to mood control, behaviour, appetite, and sleep. Each gene has two versions (from both parents) known as alleles which may be short or long. In Caspi *et al;* (2003, cited in Collishaw *et al;* 2010) Dunedin Multidisciplinary Health and Development longitudinal study a link was identified between variants of the 5 –HTTLPR gene and environment interaction, with subsequent studies (Karg *et al;* 2011) continuing to identify the diathesis –stress model. Caspi *et al;* 2003 identified 33% individuals with several reproductions of the short allele of the 5-HTTLPR were most likely to exhibit depression, anxiety and suicidality when faced with stressful life events. Whereas this was only evident in 17% of individuals with a long alleles in the same circumstances, which provides three times the transcriptional activity than a short allele, thus signifying a lower serotonin uptake. Long *et al;* 2013 study of MRI (Magnetic Resonance Imaging) of Chinese adolescents in contrast to Caucasian adolescents identified variants of the 5 –HTTLPR gene as being dissimilar in Western and Eastern populations, as the long allele of the gene was significantly associated with vulnerability and depression, not the short allele as in Caspi *et al;* 2003 study.

Rawal *et al;* (2013) systematic review suggests that neuro-cognitive and neuro-endocrine changes can have an impact upon the development of depression in adolescence. During the ages of 12-16 years this is a key period where a young person will begin the re-modelling phase of brain development. The functions of both grey and white matter are

responsible for developing certain regions within the brain. Grey matter (cells, dendrites and neurons) account for 40% of the brain, the growth increases during childhood, but reaches a peak in adolescence and then steadily declines as a person enters adulthood. Whereas this has an opposite effect for white matter (deep rooted connections responsible for communicating to different regions within the brain) which accounts for 60% of the brain, growth continues to increase in childhood, and then furthermore into adolescence and adulthood. In Asato *et al:* 2010 diffusion tensor imaging (DTI) study of white matter development in adolescence, evidence suggests there are gender differences with brain development. The maturation of white matter is stimulated upon pubertal changes, which Asato *et al*; (2010) suggests females commence at an earlier age than males.

Ruigrok et al; (2014) indicated that male brains use up to seven times more grey matter than females who instead use 10 times more white matter. This is evident within both male and female behaviours as typically males are task oriented and females are able to multitask. Furthermore as a result of the increased blood flow to the limbic cortex which encompasses the hippocampus (memory), corpus callosum (communication between two parts of the brain – left and right hemisphere) the cingulate gyrus and amydala (emotions and behaviour) this impacts upon females behaviour which may involve ruminating and revisiting previous emotional memories. Interestingly in Collishaw *et al;* (2010) national longitudinal study, there was evidence of an increase in emotional disorders in adolescents, particularly females over a twenty year period between 1986 and 2006. I believe one explanation for the increase in the development of depression in female adolescents may be as a result of commencing puberty earlier, thus this impacts upon the maturation of white matter and consequently stimulation of the limbic cortex which creates vulnerability, this is not however in my opinion an isolated cause of developing depression.

Parallel to this there are also neuro-endocrine changes that occur in adolescence, with the interactions of the Hypothalamus-Pituitary-Axis (HPA) being an essential element which controls stress and regulates emotions, mood, digestion and energy store and expenditure. Previous research studies (Rao *et al ;* 2009) have indicated that a stimulated HPA activity is linked to cortisol levels rising in response to stress, therefore in Ulrike *et al;* 2013 controlled study, the focus was on measuring the cortisol awakening response (CAR) of adolescents currently experiencing depression versus adolescents who were healthy. The results identified higher cortisol levels on awakening for the adolescents suffering from depression, which can have detrimental long term effects on brain development.

Overall it is evident that there are a number of biological factors which may impact upon a young person developing depression, thus creating a diathesis-stress model. This is apparent in the inheritability of the 5–HTTLPR gene (short allele) and exposure to stressful life events (Caspi *et al*; 2003). Additionally the neuro-cognitive and neuro-endocrine changes that occur during adolescence and exposure to negative environments have the potential to cause long term damage due to functional plasticity (the brain's ability to adapt and change to experience) as increased levels of stress accelerate cortisol levels which can reduce the hippocampus volume (atrophy) thus impacting upon memory (Rao *et al;* 2009).

3.2: Environmental and Sociological Factors:

During adolescence, young people experience huge transitions within their relationships; this is particularly evident in the parent-child relationship, as there is a shift from dependence to independence and autonomy, thus resulting in young people spending most of their time with their peers rather than their family. Therefore Platt, Kadosh and Lau (2013) systematic review of peer rejection in adolescent depression is of no surprise, as it indicates that peer

rejection precedes depression, specifically in individuals with biological and cognitive vulnerabilities. This is particularly evident in adolescent girls, as social relationships are most likely to influence their mental health than that of their male peers (Krackow & Rudolph 2008).

Adolescent romantic relationships are another transition relating to identity and its association with depression, as higher levels of romantic involvement link to higher levels of depression according to Loftus, Kelly & Mustillo's (2011) analysis of data from the National Longitudinal Survey of Adolescent Health. The studies aim was to explore the romantic relationships of adolescent girls by comparing girls between the ages of 13-15 years and 16-18 years and their link to depressive symptoms. Data waves indicated that younger adolescent girls (13-15) years were less likely to display depressive symptoms before beginning a romantic relationship, however had developed significant depressive symptoms shortly after the relationship began and up to five years later. However it was apparent that the older adolescent girls (16-18) years had a continual level of depressive symptoms at any point before and during the relationship. Several explanations for this could relate to, pressure created upon other relationships such as parent-child and peer relationships, being most likely to engage in sexual activities at an earlier age, and may also correlate with the onset of neurological and neuro-endocrine pubertal changes taking place at this metamorphic stage.

From a sociological perspective with the growing world of technology, there are approximately 90% of adolescents are online, therefore they have access to and are enthusiastic users of a range of social media sites such as Facebook. This raises an important question as to whether the increase use of the internet and social media has contributed to the rise in depression in adolescence. In Moreno *et al;* (2015) cross sectional survey identified problematic internet use particularly in female adolescents who were at increased risk of depression. Similarly Twenge (2011) generational study (1930- to date) clearly identifies a rise in mental health disorders in adolescence and suggests that social media does in fact promote narcissism. This is due to young people placing greater emphasis on extrinsic values such as body image, materialism and self-promotion, instead of intrinsic values which encourage personal goals and inner self confidence. Consequently this creates disappointment for some young people who lose their locus of control and feel the need to constantly match the ideals of their peers around them.

Incidentally Brummelman *et al;* (2015) considered two perspectives on the origin of narcissism these being psychoanalytical theory and social learning theory. Psychoanalytical theory relates to parents who withhold affection and warmth encourage a child or young person to seek the approval that their parents never gave. Whereas social learning theory relates to overvaluing their child's abilities encouraging narcissistic development when being placed on a pedestal. Following (Brummelman *et al;* 2015) four wave cross-lagged panel models being conducted it concluded that social learning theory was a key indicator in developing narcissism in children and young people. In Yap *et al:* (2013) systematic review, 140 articles were examined for their association with parenting factors and their link to depression in adolescence , this resulted in the following parenting themes being identified; authoritarian, aversiveness, inconsistent discipline, over-involvement and inter-parental conflict. Positive parental factors included autonomy granting, sociability, and parental warmth.

Interestingly both parental warmth and inter-parental conflict have produced promising results in relation to reducing the risk of depression by being used as foundations of preventative programs (Wolchik *et al;* 2002 cited in Yap *et al:* 2013).

Kilford et al; (2014) two wave longitudinal study investigated parental mental health as a risk factor for depression in adolescence, as Rawal *et al*; (2013) indicates that 40% of the offspring of depressed parents developing this disorder themselves by early adulthood.

These studies considers social learning theory, in relation to depression as being culturally transmitted rather than genetically, as young people observe and imitate family members depressive behaviours thus magnifying Bandura's social learning theory (1977). An example of this relates to a lack of positive reinforcement within a child's environment leading to negative self-evaluation and poor outlook on their future.

Basavarajappa and Khanehkeshi (2012) completed a randomised sampling of 120 adolescent students (60 boys and 60 girls) to determine the comparative link between academic stress and depression. This study demonstrated a distinct difference in academic stress and depression for both genders, which was most significant in girls. One possible reason for this could relate to girls personal identity, relationships with peers and their parents and the importance of goal setting. In addition Sharpe (2013) identified 70% of students displaying self-harming behaviour and depressive symptoms being specifically related to school pressures and exams following undertaking a survey across 41 schools in England.

Therefore there are a number of environmental and sociological factors which may contribute to adolescent depression which begins with their initial social development, as this involves becoming less dependent on parental relationships and there being an increased focus on peer relationships instead. Subsequently some extrinsic values become more prominent such as pressure around body image, academic results, materialism, romantic relationships, with as it seems internet use and social media encouraging the development of narcissism in some. Instead narcissism becomes more about wanting to feel good rather than feeling good about themselves when a young person has self-esteem (Brummelman *et al;* 2015). So whilst the parent-child relationship has changed during adolescence, it is essential that parents oversee their childs development quietly in the wings, by supporting and displaying warmth and encouragement during this turbulent stage of development.

3.3: Psychological Factors:

One key component of psychological wellbeing is emotional stability, which raises another question as to why some adolescents appear stable and others experience difficulties in coping in adverse situations. In Koval *et al;* (2012, p.3) screening studies psychological inflexibilities were considered which included "*rumination (repetitive cognitions focussing on causes and consequences of depressive symptoms) and emotional inertia (resistant to change affective states)*". This signified how rumination and emotional inertia are inextricably linked and how both cognition and affective states should both be considered when treating depression, thus this may involve combined treatment options such as medication and cognitive behavioural therapy.

Similarly anhedonia (low level of pleasurable engagement with environment) and depressed mood (feelings of sadness and emptiness) are associated with the onset of Major Depressive Disorder (Depression). Hence in Bennick *et al*;(2013) longitudinal cohort survey anhedonia and depressed mood were assessed in 2,230 adolescents aged 11-19 years. This acknowledges trajectories for both girls and boys, as anhedonia decreased from age 11 years onwards in both sexes, whereas depressed mood increased in girls from age 11 years onwards, but only at certain ages in boys such as 13.5, 16.5 and 19 years. Most importantly this study emphasises how it becomes more difficult to prevent anhedonia and depressed mood by the time a young person reaches the age of 19 years compared with earlier ages, thus signifying the importance of early detection and intervention.

Moreover there is evidence to suggest that certain personality traits may be predisposed to depression in adolescence according to Topic, Kovacevic & Mlacic (2012) cohort questionnaire study. As this examined the relationship between the big five personality traits (neuroticism, extraversion, agreeableness, conscientious and intellect) and the link to depression, which indicated a higher levels of agreeableness and neuroticism associated

with recurrent depression, and lower levels of extraversion, consciousness and intellect. According to Raabe & Spengler (2013, p.2) adolescents who have had exposure to early life adversity such as "*interpersonal loss (parental divorce, parental illness, and separation from parents/caregivers), parental maladjustment (substance misuse, parental mental health, criminality/violence) and maltreatment (physical and sexual abuse, neglect*)" are at increased risk of developing Post Traumatic Stress Disorder and Depression.

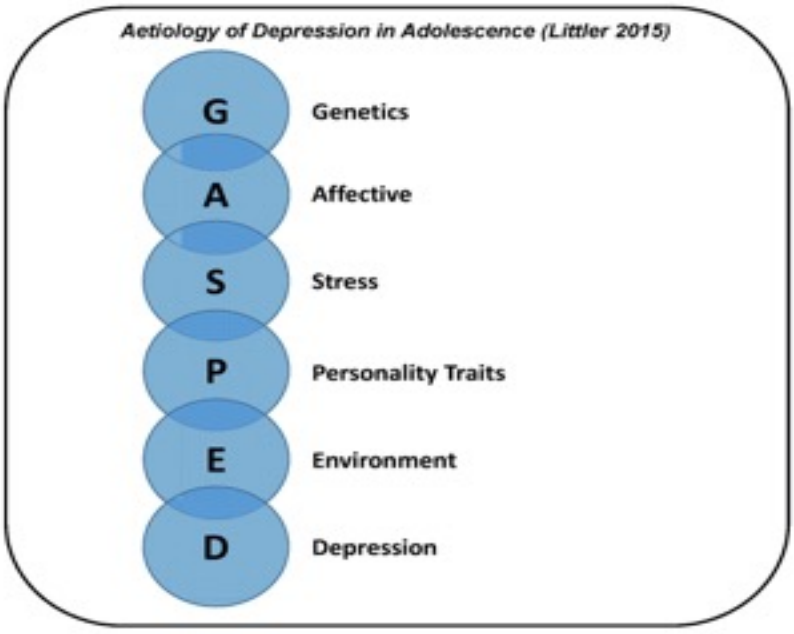
This is closely linked to the stress generation model, as during adolescence the brain is malleable during its development, therefore enduring continual sensitisation of neuronal and neuro-endocrine systems can create a vulnerability and programming of stress into adulthood. Thus the stress generation model is an extension on the diathesis –stress model according to Rapee & Kercher (2009). As in Flynn & Rudolph (2010) study, 756 adolescents completed depression questionnaires and cognitive vulnerabilities (tendency to ruminate) were measured in conjunction with stressful life events. This identified the adolescents with a number of stressful life events and high cognitive vulnerability scores experienced higher levels of depression, which suggests that cognitive vulnerabilities not only predicts risk of depression but also prevents responses to stress and may also play a part in the future generation of stressful events.

Therefore the impact of emotional stability is significant, as psychological inflexibility (emotional inertia) and the tendency to ruminate create vulnerabilities, which in turn are counterproductive in responding to stress. Aligned to this, the evidence suggests that depressed mood increases in girls, as well as certain personality traits such as neuroticism and agreeableness being closely linked to depression. This reinforces the importance of environmental/parenting factors, as these can play a key role in preventing the development of these patterns of destructive behaviour, so that adolescents are equipped to respond to interpersonal stressors which surround them on a daily basis.

4. Discussion/Conclusion:

From undertaking this review it is evident that there are a combination of key risk pathways and contributing factors associated with the development of depression in adolescents. In order to demonstrate the interaction between key risk factors and contributing factors I have developed an acronym – **GASPED** (Appendix One). The contributing factors in the first instance create vulnerabilities these include the physical, emotional and intellectual development young people undertake in adolescence such as genetics, brain development, transitions in the parent-child and peer relationships and emotional stability (Genetics, Affective and Personality Traits). Whereas I feel that the greatest risk pathway for the development of depression specifically relates to stress and the environment, which encompasses parental factors, social relationships, educational attainment, social media/ technology, early adversity causing increased sensitisation of the Hypothalamus-Pituitary-Axis (HPA), which when combined with contributing factors can create a trigger for the development of Major Depressive Disorder.

Appendix One: Aetiology of Depression in Adolescence (Littler 2015)



Whilst there has been research undertaken on the gene-environment and stress generation model, it is clear that both male and females have distinctive trajectories in terms of brain development, which I feel needs further investigation, as it is apparent that depression in adolescent girls is significantly higher (Collishaw *et al;* 2010). As discussed previously I believe this is due to vulnerabilities created by the commencement of puberty beginning earlier in females which encourages the maturation of white matter development thus stimulating the limbic cortex region of the brain associated with emotions. In conjunction with this the key risk pathway – environment is associated with educational attainment, parental factors and social relationships which is most significant in females (Krackow & Rudolph 2008). Therefore the aim of future research would be to consider the development of resources based upon the different trajectories of brain development for male and females in order to educate young people, parents/carers and professionals working in universal services and most importantly to promote the early prevention and intervention of depression.

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