Review Article

Schizophrenia: A Concise Overview of Etiology, Epidemiology Diagnosis and Management: Review of literatures

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Abstract

Schizophrenia is arguably the most severe of the psychiatric disorders. It is among the most disabling and economically catastrophic medical disorders, ranked by the World Health Organization as one of the top ten illnesses contributing to the global burden of disease.

The lifetime prevalence of schizophrenia has generally been estimated to be approximately 1% worldwide. The prevalence of schizophrenia is about the same in men and women.

The onset of schizophrenia usually occurs between the late teens and the mid 30s. The onset of schizophrenia is later in women than in men, and the clinical manifestations are less severe. For males, the peak age of onset for the first psychotic episode is in the early to middle 20s; for females, it is in the late 20s. This may be because of the antidopaminergic influence of estrogen.

Schizophrenia is a disease caused by biopsychosocial influences, including genetic, perinatal, neuroanatomic, neurochemical and other biologic abnormalities. In addition psychological and socioenvironmental factors may increase the risk of schizophrenia in international migrants or urban populations of ethnic minorities. Increased paternal age is associated with a greater risk of schizophrenia.

Diagnosis of Schizophrenia must be made after differentiating other psychiatric and medical illnesses, as well as from disorders such as heavy metal toxicity, adverse effects of drugs, and vitamin deficiencies which may manifest with psychosis.

Schizophrenia treatment requires an integration of medical, psychological, and psychosocial inputs. The bulk of care occurs in an outpatient setting and is best carried out by a multidisciplinary team. Psychosocial rehabilitation is an essential part of treatment

Keywords: Schizophrenia; Antipsychotics; Psychotherapy; Neurotransmitters; Epidemiology

Background

Schizophrenia is a clinical syndrome of variable, but profoundly disruptive, psychopathology that involves cognition, emotion, perception, and other aspects of behavior. The hallmark symptom of schizophrenia is psychosis, such as experiencing auditory hallucinations (voices) and delusions (fixed false beliefs) [1]. It is arguably the most severe of the psychiatric disorders. Schizophrenia is among the most disabling and economically catastrophic medical disorders, ranked by the World Health Organization as one of the top ten illnesses contributing to the global burden of disease [2].

It carries a lifetime risk of around 0.5-1%, and its early onset and tendency to chronicity mean that its prevalence is relatively high. Disability results, particularly from negative symptoms and cognitive deficits, features that can have a greater impact on long-term functioning than the more dramatic delusions and hallucinations which often characterize relapses. The social and economic impact of the illness is enormous, and its impact on sufferers and their families can be devastating [1].

Schizophrenia is a clinical diagnosis. It must be differentiated from other psychiatric and medical illnesses, as well as from disorders such as heavy metal toxicity, adverse effects of drugs, and vitamin deficiencies [3].

Treatment of schizophrenia requires an integration of medical, psychological, and psychosocial inputs. The bulk of care occurs in an outpatient setting and is best carried out by a multidisciplinary team. Psychosocial rehabilitation is an essential part of treatment [3].

Etiology of Schizophrenia

Research has identified several factors that contribute to the risk of developing schizophrenia. It is a disease caused by biopsychosocial influences including genetic, perinatal, neuroanatomic, neurochemical and other biologic abnormalities. In addition,

psychological and socio-environmental factors may increase the risk of schizophrenia in international migrants or urban populations of ethnic minorities. Increased paternal age is associated with a greater risk of schizophrenia [4,5,6].

Genetic factors

Studies indicate that schizophrenia runs in families. The risk of schizophrenia is elevated in biologic relatives of persons with schizophrenia but not in adopted relatives [7]. The risk of schizophrenia in first-degree relatives of persons with schizophrenia is 10%. If both parents have schizophrenia, the risk of schizophrenia in their child is 40%. Concordance for schizophrenia is about 10% for dizygotic twins and 40-50% for monozygotic twins.

The modes of genetic transmission in schizophrenia are unknown, but several genes appear to make a contribution to schizophrenia vulnerability. Linkage and association genetic studies have provided strong evidence for nine linkage sites: 1q, 5q, 6p, 6q, 8p, 10p, 13q, 15q, and 22q. Further analyses of these chromosomal sites have led to the identification of specific candidate genes, and the best current candidates are alpha-7 nicotinic receptor, DISC 1, GRM 3, COMT, NRG 1, RGS 4, and G 72. Recently, mutations of the genes dystrobrevin (DTNBP1) and neureglin 1 have been found to be associated with negative features of schizophrenia [8,9,10,11,12].

In a recent study, researchers identified new genetic loci not previously known to be associated with schizophrenia. Of the 108 genetic loci linked to schizophrenia that were identified in the study, 83 had not previously been found. The investigators also determined that among 128 independent associations related to the 108 loci, enriched associations existed not only among genes expressed in the brain, but also among those expressed in tissues related to immunity, giving support to the theory linking the immune system to schizophrenia. Some loci of particular interest include the following: Catechol-O-Methyltransferase (COMT) gene, RELN gene , Nitric Oxide Synthase 1 Adaptor Protein (NOS1AP) gene, nMetabotropic Glutamate Receptor 3 (GRM3) gene [8-13].Other genetic changes involve the structure of the gene. For example, copy number variants are deletions and duplications of segments of DNA; they can involve genes or regulatory regions. These variants are usually inherited, but can arise spontaneously. Copy number variants such as the deletions found at 1q21.1, 15q13.3, and 22q11.2 increase the risk of developing schizophrenia [14,15,16]. At most, however, these findings probably account for only a small part of the heritability of schizophrenia.

In a study of 39,000 people referred to a diagnostic laboratory, about 1000 had a copy number variant at 1 of the following loci: 1q21.1, 15q11.2, 15q13.3, 16p11.2, 16p13.11, and 22q11.2. Clinically, these people had various neurologic or psychiatric disorders, including developmental delay, intellectual disability, and autism-related disorders. Subjects also had congenital anomalies [17].

Many studies have also looked for abnormalities in neurodevelopmental genes. Disruptions in the DISC1, NRG1, DTNBP1, KCNH2, AKT1, and RGS4 genes have been associated with schizophrenia, albeit with significant variability between studies [18-30].These findings also lend support to the hypothesis that schizophrenia is a disease in which multiple rare genetic variants lead to a common clinical outcome.

As can be seen, working out the details of these genetic factors is difficult. Interactions with the rest of the genome and with the environment will doubtless prove to be important. Nonetheless, a meta-analysis of twin studies estimated that genetic factors account for about four fifths of liability to schizophrenia [31].

Neurotransmitters (Biochemical factors)

Multiple biochemical pathways likely contribute to schizophrenia, which is why detecting one particular abnormality is difficult. A number of neurotransmitters have been linked to this disorder, largely based on patients' responses to psychoactive agents. Dopamine, serotonin, norepinephrine, GABA and glutamate are among the common neurotransmitters involved in pathogenesis of schizophrenia [32-36].

The role of dopamine in schizophrenia is based on the dopamine Hypothesis, which evolved from two observations. First, drug group which blocks dopamine function, known as the phenothiazines, could reduce psychotic symptoms. Second, amphetamines, which increase dopamine release, can induce a paranoid psychosis and exacerbate schizophrenia and that disulfiram inhibits dopamine hydroxylase and exacerbates schizophrenia [32-34].

The role of glutamate in schizoprenia is largely based on Glutamate hypothesis, reduced function of the NMDA glutamate receptor is implicated in the pathophysiology of schizophrenia. This has largely been suggested by abnormally low levels of glutamate receptors found in postmortem brains of people previously diagnosed with schizophrenia and ingestion of phencyclidine and ketamine a glutamate antagonist, produces an acute syndrome similar to schizophrenia and mimic cognitive problems associated with schizophrenia [32,35,36].

Serotonin hypothesis is another evidence of schizophrenia indicating, serotonin excess as a cause of both positive and negative symptoms in schizophrenia. The serotonin antagonist activity of clozapine and other second-generation antipsychotics, coupled with the effectiveness of clozapine to decrease positive symptoms in chronic patients has contributed to the validity of this proposition [32].

Norepinephrine neurotransmitters implicated in the pathophysiology of schizophrenia where selective neuronal degeneration within the norepinephrine reward neural system could account for anhedonia in schizophrenic patients [32,34].

The other neurotransmitter implicated in the pathophysiology of schizophrenia is G-Aminobutyric Acid (GABA). GABA has a regulatory effect on dopamine activity, and the loss of inhibitory GABAergic neurons could lead to the hyperactivity of dopaminergic neurons [32,34].

Pregnancy and birth complications (perinatal factors)

Studied suggests pregnancy and birth complications can have a small effect on the risk of later development of schizophrenia. Women who are malnourished or who have certain viral illnesses during their pregnancy may be at greater risk of giving birth to children who later develop schizophrenia [37]. For example, children born to Dutch mothers who were malnourished during World War II have a high rate of schizophrenia.

After the 1957 influenza A2 epidemics in Japan, England, and Scandinavia, rates of schizophrenia were higher among offspring of women who contracted influenza during their second trimester. Women in California who were pregnant between 1959 and 1966 were more likely to have a child who developed schizophrenia if they had influenza in the first trimester of their pregnancy [38].

Obstetric complications may be associated with a higher incidence of schizophrenia [39]. A study of Finnish women supported an interaction between genetic and environmental influences on causation of schizophrenia [40].In this study, a review of 9596 women in Helsinki who received hospital treatment during pregnancy for an upper urinary tract infection between 1947 and 1990 found no overall significant increase in the risk of schizophrenia among their offspring but a 5-fold higher risk among the offspring of women who also had a family history of psychosis. The authors estimated that among offspring of women with both prenatal pyelonephritis and a positive family history of psychotic disorders, 38-46% of schizophrenia cases resulted from the synergistic action of the 2 risk factors [40].

Season of birth

Children born in the winter months may be at greater risk for developing schizophrenia.. Winter birth in people who later develop schizophrenia is a robust epidemiological finding, at least in the northern hemisphere. It is likely to be a proxy indicator for some seasonally fluctuating environmental factor. The most popular hypotheses relate to seasonal variation in exposure to intrauterine viral infections around the time of birth, or variation in light, temperature/weather, or external toxins [39].

Cannabis use

Different studies suggest that heavy marijuana use in teenagers aged 15-17 years may hasten the onset of psychosis in those at high risk for developing a psychotic disorder. In an analysis of 247 hospitalized patients who had experienced first-episode psychosis, the Allied Cohort on the Early course of Schizophrenia (ACES)-II project found that the onset of psychosis in those who used cannabis from age 15 to 17 years occurred at a mean age of 21.07 years, compared with a mean age of 23.86 years in patients who did not use cannabis during those same teenage years. However, the researchers could not say whether marijuana use may actually cause psychosis to develop early or whether people who have a predilection for earlier onset of psychosis also may be more likely, owing to various factors, to use marijuana [41].

Epidemiology

Global prevalence of schizophrenia

The lifetime prevalence of schizophrenia has generally been estimated to be approximately 1% worldwide [42]. However, a systematic review by Saha et al of 188 studies drawn from 46 countries found a lifetime risk of 4.0 per 1000 population; prevalence estimates from countries considered least developed were significantly lower than those from countries classed as emerging or developed [43]. Immigrants to developed countries show increased rates of schizophrenia, with the risk extending to the second generation [44-46].

Socio demographic factors

The onset of schizophrenia usually occurs between the late teens and the mid 30s [3]. For males, the peak age of onset for the first psychotic episode is in the early to middle 20s; for females, it is in the late 20s. The first 5-10 years of the illness can be stormy, but this initial period is usually followed by decades of relative stability (though a return to baseline is unusual). Positive symptoms are more likely to remit than are cognitive and negative symptoms [3].

Although some variation by race or ethnicity has been reported, no racial differences in the prevalence of schizophrenia have been positively identified. Some research indicates that schizophrenia is diagnosed more frequently in black people than in white people; this finding has been attributed to the cultural bias of practitioners.

The prevalence of schizophrenia is about the same in men and women. The onset of schizophrenia is later in women than in men, and the clinical manifestations are less severe. This may be because of the antidopaminergic influence of estrogen.

Suicide and aggression in schizophrenia

Patients with schizophrenia also have high rates of suicide. Even though schizophrenia has a relatively low prevalence (1%), a recent review estimated that up to 50 percent of schizophrenic patients attempt suicide and up to 13 percent of all deaths due to suicide are attributable to schizophrenia [48]. People with schizophrenia are more likely to use serious and violent methods in response to hallucinatory voices and delusions compared to patients with other disorders [49]. Compared to the general population (suicide prevalence about 1 percent), people with schizophrenia have a more than eight-fold increased risk of suicide. They also have an increased risk of death from natural causes such as cardiovascular and respiratory diseases [44].

In the mind of the general public, schizophrenia is sometimes synonymous with unreasoned violence. For those with schizophrenia, and for their families and advocates for those with mental illness, the real problem is that people with schizophrenia are far more likely to be the victims of violence than the general populations, which increased stigmatization and poorer treatment outcomes. Probably the most important causes are the presence of comorbid substance abuse, dependence, and intoxication. In addition, the disease process itself may produce hallucinations and delusions, which may provoke violence. Often, poor impulse control related to neuropsychiatric deficits may facilitate the discharge of aggressive tendencies. Moreover, failure to treat schizophrenic patients adequately is a major risk factor for aggression. The finding suggests that people with schizophrenia are four times as likely as people without schizophrenia to be engaged in violent acts [3,46].

Diagnosing Schizophrenia (Current Diagnostic Criteria- DSM-5)

Diagnosing schizophrenia is difficult because there is no single symptom which is unique to schizophrenia and there are no definitive blood tests or scans for the disorder. Making a diagnosis currently requires recognizing a constellation of symptoms for at least 6 months. Seeing a deterioration in the level of functioning of the person with the symptoms, as well as 'ruling out' other possible explanations for the observed disturbance.

Table 1: DSM- V diagnostic criteria for schizophrenia.

DSM-V Diagnostic Criteria for Schizophrenia
A. Two (or more) of the following, each present for a significant portion of time during a 1 -month period (or less if successfully treated). At least one of these must be (1), (2), or (3):
1. Delusions.
2. Hallucinations.
3. Disorganized speech (e.g., frequent derailment or incoherence).
4. Grossly disorganized or catatonic behavior.
5. Negative symptoms (i.e., diminished emotional expression or avolition).
B. For a significant portion of the time since the onset of the disturbance, level of functioning in one or more major areas, such as work, interpersonal relations, or self-care, is markedly below the level achieved prior to the onset (or when the onset is in childhood or adolescence, there is failure to achieve expected level of interpersonal, academic, or occupational functioning).
C. Continuous signs of the disturbance persist for at least 6 months. This 6-month period must include at least 1 month of symptoms (or less if successfully treated) that meet Criterion A (i.e., active-phase symptoms) and may include periods of prodromal or residual symptoms. During these prodromal or residual periods, the signs of the disturbance may be manifested by only negative symptoms or by two or more symptoms listed in Criterion A present in an attenuated form (e.g., odd beliefs, unusual perceptual experiences).
D. Schizoaffective disorder and depressive or bipolar disorder with psychotic features have been ruled out because either 1) no major depressive or manic episodes have occurred concurrently with the active-phase symptoms, or 2) If mood episodes have occurred during active-phase symptoms, they have been present for a minority of the total duration of the active and residual periods of the illness.
E. The disturbance is not attributable to the physiological effects of a substance (e.g., a drug of abuse, a medication) or another medical condition.
F. If there is a history of autism spectrum disorder or a communication disorder of child hood onset, the additional diagnosis of schizophrenia is made only if prominent delusions or hallucinations, in addition to the other required symptoms of schizophrenia, are also present for at least 1 month (or less if successfully treated).
Specify if:
The following course specifies are only to be used after a 1-year duration of the disorder and if they are not in contradiction to the diagnostic course criteria.
First episode, currently in acute episode: First manifestation of the disorder meeting the defining diagnostic symptom and time criteria. Acute episodes a time period in which the symptom criteria are fulfilled.
First episode, currently in partial remission: Partial remission is a period of time during which an improvement after a previous episode is maintained and in which the defining criteria of the disorder are only partially fulfilled.
First episode, currently in full remission: Full remission is a period of time after a previous episode during which no disorder-specific symptoms are present.
Multiple episodes, currently in acute episode: Multiple episodes may be deter mined after a minimum of two episodes (i.e., after a first episode, a remission and a minimum of one relapse).
Multiple episodes, currently in partial remission
Multiple episodes, currently in full remission
Continuous: Symptoms fulfilling the diagnostic symptom criteria of the disorder are remaining for the majority of the illness course, with sub threshold symptom periods being very brief relative to the overall course.
Unspecified
The presence or absence of catatonia is specified. Individuals meeting the criteria for catatonia receive an additional diagnosis of catatonia associated with schizophrenia to indicate the presence of the comorbidity.
Finally, the current severity of the disorder is specified by evaluating the primary symptoms of psychosis and rating their severity on a 5-point scale ranging from 0 (not present) to 4 (present and severe).

According to DSM -5- Six criteria's are required for the diagnoses of schizophrenia [3]

The DSM-V Symptomatic criterion (Criterion A): The DSM-V symptomatic criterion (Criterion A) requires the presence of a characteristic symptom or symptoms for at least 1-month duration or for less time if there is successful treatment. At least two Criterions A symptoms must be present for a significant portion of time during a 1-month period or longer. At least one of these symptoms must be the clear presence of delusions (Criterion Al), hallucinations (Criterion A2), or disorganized speech (Criterion A3). Grossly disorganized or catatonic behavior (Criterion A4) and negative symptoms (Criterion A5) may also be present (Table 1).

Diagnostic Criteria (Criterion B): Functioning: In addition to the cross-sectional criteria, DSM-V requires the presence of significant deterioration in one or more major areas of functioning, such as work, interpersonal relations, or self-care (Table 1).

Criteria (Criterion C): Duration: The DSM-V criteria require a total duration of 6 months. Within this 6-month period, there must be at least 1 month of active-phase symptoms (overt psychotic symptoms). A shorter duration of the active phase is allowed only if successful treatment is instituted. The rest of the 6-month period may include continuing psychotic symptoms, prodromal symptoms preceding clear-cut psychosis, or residual symptoms after the resolution of the psychotic symptoms. Residual symptoms are defined as attenuated forms of psychotic symptoms, such as odd beliefs, magical thinking, ideas of reference, odd perceptual experiences, peculiar or concrete thinking, vague speech, or odd behavior. Negative symptoms may also be included as residual symptoms (Table 1).

Diagnostic Criteria (Criterion D-F): Exclusions: The DSM-V Criteria require that mood and schizoaffective disorder be ruled out to make the diagnosis of schizophrenia. The patient should not meet criteria for a manic or depressive episode during the psychotic phase, or if there is a concomitant mood episode with active phase symptoms, the duration of the mood episodes should be brief relative to the duration of the psychotic illness. This includes residual symptoms.

In additions DSM-IV Excludes a diagnosis of schizophrenia if the symptoms are the result of a direct physiological effect of a substance, a drug of abuse, or a medication, as well as when the symptoms are due to a neurological or medical condition.

Management of Schizophrenia

Although antipsychotic medications are the mainstay of the treatment for schizophrenia, research has found that psychosocial

interventions, including psychotherapy, can augment the clinical improvement. Just as pharmacological agents are used to treat presumed chemical imbalances, no pharmacological strategies must treat no biological issues. The complexity of schizophrenia usually renders any single therapeutic approach inadequate to deal with the multifaceted disorder. Psychosocial modalities should be integrated into the drug treatment regimen and should support it. Patients with schizophrenia benefit more from the combined use of antipsychotic drugs and psychosocial treatment than from either treatment used alone [46,47].

Pharmacological managements

Pharmacologic management has changed over the past decade for schizophrenia, in part owing to the acceptance of a new class of medications, generally termed atypical, novel or second-generation antipsychotics. These medications are reported to have a lower incidence of side effects than the older antipsychotics, and their use has arguably become first-line [46,47]

Atypical antipsychotics: New group of antipsychotics (second generation or atypical) emerged in the 1980s.The second generation antipsychotics showed similar effectiveness but fewer extra-pyramidal effects [38]. These newer, second-generation medications are generally preferred and are first line of treatment for schizophrenia, because they pose a lower risk of serious side effects than do conventional medications [48,49]. They include: Aripiprazole, clozapine , olanzapine , quetiapine , risperidone , riprasidone .

Clozapine is preferred drug for Management of severely ill schizophrenic patients who fail to respond adequately to standard drug treatment for schizophrenia and reducing the risk of recurrent suicidal behavior in patients with schizophrenia or schizoaffective disorder [48,49]. Whereas clozapine was reserved for patients with illnesses that were poorly responsive to available antipsychotic drugs, risperidone was a first-line antipsychotic that could be administered to nearly every patient with a psychotic illness [59].

Conventional, or typical, antipsychotics: These first-generation medications have frequent and potentially significant neurological side effects, including the possibility of developing a movement disorder (tardive dyskinesia) that may or may not be reversible [51,52]. This group of medications includes: Chlorpromazine, fluphenazine, haloperidol thioiridazine and others. These antipsychotics are often cheaper than newer counterparts, especially the generic versions, which can be an important consideration when long-term treatment is necessary. Use of FGAs has declined in the last few years, mainly because of an increase in prescriptions of second-generation agents. Since FGAs are considerably less expensive than newer antipsychotics, they remain a valuable option in the treatment of psychotic disorders [32].

For non adherent schizophrenic patients long acting antipsychotics are used. Long Acting Injectable (LAI) antipsychotics are a pharmacologic strategy for treating patients with schizophrenia who relapse due to no adherence to antipsychotic medication. Rather than the daily pill-taking required with oral antipsychotics, LAI antipsychotics are administered by injection at two to four week intervals [32].

Psychosocial interventions

Once psychosis recedes, psychological and social (psychosocial) interventions are important – in addition to continuing on medication. These may include:

Psychoeducation: Psychoeducational interventions include any discrete program involving interaction between an information provider and service users or their careers which has the primary aims of offering information about the condition and the provision of support and management strategies. Psychoeducation offered as a specific intervention, as distinct from the provision of good quality and accessible information to all people with schizophrenia and their careers which is considered to be a requirement of good standard care [51,52].

Cognitive behavioral therapy (CBT) also referred to as CBT for psychosis (CBTp): A structured and collaborative therapeutic approach, CBT is a discrete psychological intervention which aims to make explicit connections between thinking, emotions, physiology and behaviour with respect to current or past problems, primarily through behavioural experiments and guided discovery. CBT seeks to achieve systemic change through the reevaluation of perceptions, beliefs or reasoning thought to cause and maintain psychological problems. The aim is to help the individual normalise and make sense of their psychotic experiences, and to reduce the associated distress and impact on functioning. Targeted outcomes include symptom reduction (positive or negative psychotic symptoms and general symptoms including mood), relapse reduction, enhancement of social functioning, development of insight, amelioration of distress, and the promotion of recovery [53].

Social skills training: Social skills training is a structured psychosocial intervention that aims to enhance social performance and reduce distress and difficulty in social situations. Interventions include behaviourally-based assessments of a range of social and interpersonal skills and place importance on both verbal and non-verbal communication, the individual's ability to perceive

and process relevant social cues, and respond to and provide appropriate social reinforcement [54].

Family intervention: Family intervention is a discrete psychological intervention with a specific supportive, educational or treatment function which involves problem solving/crisis management and/or intervention with the identified service user. Family intervention for individuals diagnosed with schizophrenia has developed out of the consistent finding that the emotional environment within a family was an effective predictor of relapse. In this context, 'family' includes people who have a significant emotional connection to the individual, such as parents, siblings and partners. Different models of family intervention aim to help families cope with their relative's problems more effectively, provide support and education for the family, reduce levels of distress, improve the ways in which the family communicates and negotiates problems, and try to prevent relapse by the service user [52].

Adherence therapy: Adherence therapy is a brief intervention which explores an individual's ambivalence to treatment and maintenance medication. It refers to any discrete and structured program, tailored to the individual's needs, involving interaction

between service provider and service user, during which service users are provided with support, information and management strategies to improve their adherence to medication and/or with the specific aim of improving symptoms, quality of life and preventing relapse [55,56].

Arts therapies: Arts therapies (art, body-oriented or music) combine psychotherapeutic techniques with activities aimed at promoting creative expression. Arts therapies aim to enable people diagnosed with schizophrenia to experience themselves differently and to develop new ways of relating to others; help people express themselves and to organise their experience into a satisfying and 'containing' aesthetic form; and to help people to accept and understand feelings that may have emerged during the creative process [52].

Cognitive remediation: Cognitive remediation is a behavioural treatment for people who are experiencing cognitive impairments that may interfere with daily functioning. Cognition refers to a broad set of abilities that together allow us to perceive process, manipulate, and respond to information. Examples of cognitive functions are attention, memory, organisation and functioning. Many people with schizophrenia experience some problems in these domains and this may limit their recovery in areas such as daily living, social or vocational functioning. Cognitive remediation programs employ a variety of methods, but increasingly rely on computerized learning, in order to help people develop particular cognitive skills [52].

Contingency management: Contingency management strategies refer to behavioral programs in which specific target behaviours are positively reinforced through monetary incentives or other reward systems [57,58].

Electroconvulsive therapy for schizophrenia

Electroconvulsive Therapy (ECT) was first introduced as a treatment for schizophrenia in 1938 [59]. ECT is an effective treatment for the symptoms of acute schizophrenia; it is not for those of chronic schizophrenia. Patients with schizophrenia who have marked positive symptoms, catatonia, or affective symptoms are considered most likely to respond to ECT. In such patients, the efficacy of ECT is about equal to that of antipsychotics, but improvement may occur faster. In certain situations, for example, treatment-resistant schizophrenia, ECT augmentation is still the treatment of choice [60]. ECT is often used in addition to antipsychotics in the treatment of schizophrenia. Studies have shown that a combination of ECT and antipsychotics has a significant advantage with respect to rapidity or quality of response [38,61-65].

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