



The Effects of Diaphragmatic Breathing and Cyclic Meditation on Mental Health and HIV Risky Behaviour among Inmates in Zambian Correctional Facilities: A Cross Sectional Intervention Study

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Abstract

Introduction: A growing number of empirical studies have revealed that diaphragmatic breathing and cyclic meditation may trigger body relaxation responses and benefit both physical and mental health. However, the specific benefits of diaphragmatic breathing on mental health remain largely unknown and those of cyclic meditation have been documented. The present study aimed to investigate the efficacy of diaphragmatic breathing and cyclic meditation as an intervention on mental health and HIV risky behaviour among inmates in Zambian correctional facilities.

Methods: The intervention study, used systematic randomised controlled method to assign inmates with current psychotic disorders into groups A and B with exception of C. Twenty-four inmates were enrolled in three different intervention groups (A,B and C), 8 in each group. Three different types of interventions were developed based on the theory of planned behaviour and guidance by the WHO recommended "gold" standard treatment (pharmacotherapy and psychotherapy) options for managing psychotic disorders. Each group received different intervention package and were statistically compared at six weeks. Group A, (N=8) received antipsychotic drugs, practiced cyclic meditation, regulated breathing techniques and group psychoeducation twice every week for six weeks. Group B, (N=8) received antipsychotic drugs and psychoeducation twice weekly for six weeks. Group C, received anti-psychotic medication only.

Results: Findings suggested that inmates in Group A, had the best prognosis compared to the other groups, followed by group B and C recorded poor prognosis. Results showed that after the intervention, inmate's mental wellbeing had tremendously improved with the exception of group C. Group A, indicated a statistically positive improvement with 94.71% change compared to groups B 44.2% and C 15.25%. Within groups, group A, indicated a positive improvement in mental wellbeing followed by groups B and C. Therefore, the intervention in group a resulted in a positive outcome to the

inmates' mental wellbeing. After intervention, HIV risk behaviours were eradicated in groups A and B with exception of C.

Conclusion: The combination therapy of antipsychotics, cyclic meditation, regulated breathing techniques and group psychoeducation suggested being an effective intervention package with significant positive outcomes in improving inmates' psychotic disorders, general mental wellbeing and HIV risk behaviour. This study provided evidence demonstrating the effects of diaphragmatic breathing, a mind body practice, on mental function, from a health psychology approach, which has important implications for health promotion in healthy individuals.

Keyword: Psychology; Antipsychotics; Cyclic meditation; HIV

Introduction

Regulated breathing techniques, also known as "diaphragmatic breathing" or "deep breathing," is defined as an efficient integrative body mind training for dealing with stress and psychosomatic conditions. Diaphragmatic breathing involves contraction of the diaphragm, expansion of the belly and deepening of inhalation and exhalation, which consequently decreases the respiration frequency and maximizes the amount of blood gases. Cyclic Meditation (CM) is a technique of 'moving meditation', which combines the practice of yoga postures with guided meditation. All meditations, irrespective of the strategies involved are believed to help reach the state of an uninterrupted flow of consciousness without the distraction of the mind. There are several strategies in CM that include breath awareness, awareness of internal sensations that makes it applicable to people with different tendencies such as hyperactive mind, sluggish mind or balanced mind. In CM, the period of practicing yoga postures constitutes the awakening practices, while periods of supine rest comprise calming practices. An essential part of the practice of CM is being aware of sensations arising in the body. This supports the idea that a combination of stimulating and calming techniques practiced with a background of relaxation and awareness (during CM) may reduce psycho physiological arousal more than resting in a supine posture for the same duration [1].

Mental health and HIV may be closely interlinked. Mental health problems, including substance use disorders, are associated with increased risk of HIV and interfere with treatment and conversely some psychiatric disorders occur as a direct result of HIV infection. Studies have demonstrated a high seroprevalence of HIV in people with serious chronic psychiatric disorders. Prevalence rates in mentally ill inpatients and outpatients have been reported to be between 5% and 23%, compared with a range of 0.3% to 0.4% in the general population in the United States of America over comparable periods. Some studies have reported behavioural risk factors for transmission of HIV in between 30% and 60% of people with severe psychiatric disorders. These risks include high rates of sexual contact with multiple partners, injecting drug use, sexual contact with injecting drug users, sexual abuse, unprotected sex between men and low use of condoms. Besides these behavioural risks, psychiatric disorders may also interfere with the ability to acquire and/or use information about HIV and AIDS and subsequently to practice safer

behaviour, also increasing the likelihood of situations occurring in which risk behaviours are more common like in correctional facilities [2].

A study by Dhansoa found out that practicing yoga has the potential in reducing state of anxiety and enhancing psychomotor performance in patients suffering from generalized anxiety disorders. Available data indicates yoga reduces symptoms of anxiety, with 19 of 27 published research studies that examined the effect of yoga on anxiety, demonstrating significant reduction in subjective measures of anxiety. On the other hand, yoga is believed to relieve anxiety by turning off the Hypothalamic-Pituitary Adrenal (HPA) axis and sympathetic nervous system responses to stress. For example, in a randomized controlled trial, 12 weeks of yoga practice was found to be superior to walking exercises in improving mood, decreasing anxiety and increasing brain of γ -aminobutyric acid [3].

Yoga results in a strong nervous system for developing emotional and mental stability and breathing exercises are integral in this development. The practice of slow, regulated and relaxed breathing is associated directly to calming the mind and maintaining equanimity and a healthy diaphragm, which is important for a gentle, effortless breath. The forward bends done with head resting on a bolster or blocks are calming to the nervous system and help relieve immediate symptoms of anxiety. In addition, the supported bends help increase lung expansion and tone the diaphragm, which are important for the developing control of the breath.

Among other areas where yoga can help in correctional facilities include reducing the transmission of HIV and AIDS, MSM (depending on the accepted culture of particular country), violence and paedophilia. For example, HIV and AIDS in low, middle and high income countries has been a health problem of major concern. Correctional facilities have grossly disproportionate rates of HIV infection and confirmed AIDS. How will yoga influence positively in reducing epidemic prevalence rate? The use and teaching of yoga combined with other intervention tools, inmates may come to learn about the set of don'ts and behavioural modification. These according to YIC are universal vows which teach us about the don'ts of life which include; non-violence, truthfulness, non-stealing, celibacy and non-covetousness.

The one, which is more applicable in the fight of HIV transmission, is the practice of celibacy among inmates. In this context, celibacy is being referred to as self-restrain or control of sexual desires. If inmates embrace the science of yoga, then they can possess the will power to refrain from sexual gratification desires thereby reducing inmate to inmate transmission of HIV and AIDS. It therefore follows that if these behavioural HIV risk factors are alleviated through yogic practice, correctional facility environments will be free of the epidemic. This is very attainable because yoga emphasizes on methods of coping and at the same time, it provides the devotee with techniques for dealing with stress and anxiety and often experienced early in the training practices that provide the desire in individuals for real change [4-6]. Yoga alone has been found to improve mental health related problems and improve on the general social wellbeing of individuals.

It is arguably correct to suggest that the available data, both scientific and research evidence back up the claim that yogic practices can indeed be the panacea to many correctional facilities related mental and HIV problems among the incarcerated in order to better their lives. Yogic practices have the potential to change the mental

attitude and behaviour of inmates to make them useful and civilized members of society on their release. It is because of this positive impact and results or research findings around the world that we need to give credibility to yoga and make it more acceptable in the correctional facility establishments around the globe.

Materials and Methods

Study design and procedures

Recruitment: This was a follow-up study (study-II) of the larger study. The sample sites were medium (Lusaka Central) and maximum security (Mwembeshi) correctional facilities respectively. The two facilities were chosen because of the high prevalence of psychiatric disorders (study 1 results), HIV, HIV behavioural and mental health risk factors and poor mental wellbeing recorded in socio-epidemiological assessment (targeted for intervention in follow-up study). Inmates were randomly assigned into groups A and B. Groups A and B were from medium and C from maximum correctional facilities respectively. From medium, 36 participants were eligible however, using systematic random sampling, only 16 were randomly assigned into groups A (n=8) and B (n=8). Using a progression list, we randomly assigned every second person on the list to either group A or B. After random assigning of participants to either group, one participant from each group was asked to pick letters A or B from the box [7]. The letter picked became the assigned group. For group C, participants were purposively sampled.

Ethical review: The study commenced after approval by ministry of home affairs through Zambia correctional service and ethical approval by University of Zambia biomedical research ethics committee (IRB00001131 of IORG0000774).

Inclusion criteria: The study included all inmates serving more than three month sentence and willing to voluntarily participate and diagnosed with psychotic disorders only; those who were not on any form of treatment and medication for psychiatric disorders and all inmates who were not diagnosed with any form of psychiatric disorders except psychotic disorder current.

Measures: We administered the following instruments in English; socio-demographic questionnaire assessed age, gender, facility type, type of crime commissioned, length of prison stay, HIV status and HIV behavioural risk factors. Mini international neuro-psychiatric interview assessed for presence or absence of psychiatric disorders (psychotic disorders) and determined the prognosis of psychotic features. The HIV risk-taking behavioural scale determined change in HIV risk behaviour before and after the intervention. The Warwick-Edinburgh mental wellbeing scale assessed and determined the prognosis of general mental wellbeing before and after the intervention. All instruments used are internationally standardized [8].

Intervention delivery: All interventions and tests were performed in a quiet room at the correctional facility clinic. We reasoned that this would avoid any potential anxiety that could be brought on by other inmates. Participants sat comfortably on the floor in a circle throughout the practice. Participants learnt basic knowledge and essential skills about diaphragmatic breathing and became familiar with experiencing breathing in as deeply as possible and then exhaling almost all the air from the lungs, slowly, in a self-controlled, slow rhythm, under the guide of the principal researcher. All participants were instructed to focus on their breathing and the sensations produced in the body, while sitting comfortably with their eyes closed.

Participants were considered as performing diaphragmatic breathing if their respiratory rate decreased while their respiratory amplitude increased in waveform (inmates' subjective personal account of their experiences).

Diaphragmatic breathing

After this learning phase, group A received 12 sessions of breath controlling intervention for six weeks. Each intervention involved a 15 min resting breathing session and a 15-min diaphragmatic breathing session consequently [9]. The diaphragmatic breathing session began with general verbal guidance from the principal researcher, who spoke at a slow speed to help participants become more easily involved. During resting breathing, participants were instructed to breathe in a normal state. During diaphragmatic breathing, they were instructed to inhale as deeply as they could while their abdomen expanded and to exhale as slowly as they could while their abdomen contracted, in a self-paced rhythm, under the instruction of the principal researcher [10].

Cyclic Meditation (CM)

After gently coming up in sitting position from Quick Relaxation Technique (QRT), principal researcher gave instruction to participants as follows; lie down for a long Deep Relaxation Technique or (DRT). Part by part, from toes to top, relax your whole body by moving the consciousness from one part to other. This may take about ten minutes. After that, slowly sit down in deep silence according to your time. Throughout the CM practice, participants kept their eyes closed and followed the instructions of the principal researcher. The instructions emphasized carrying out the practice slowly, with awareness and relaxation, followed by isometric contraction of the muscles of the body ending with supine rest (1 min), slowly coming up from the left side and standing at ease and "balancing" the weight on both feet (called centring) (2 min) [11]. The first actual posture consisted of bending to the right (80s), a pause of 70s with instructions regarding relaxation and awareness, bending to the left (80s), a pause (70s), backward bending (80s), a pause (70s), forward bending (80s), another pause (70s), backward bending (80s) and slowly coming down to supine posture with instructions to relax different parts of the body, followed by Q.R.T in sequence (5min). This was followed by sitting and forward bending posture, namely, 80s and camel posture (80s), followed by D.R.T for 12 min. In all these, awareness is focused and sensation felt on each part of the body step by step from toes to the tip of the head. The total duration of the practice was 35 minutes. The key features of CM are (I) postures interposed with relaxation, (II) slowness of movements, (III) continuity, (IV) inner awareness and (VI) recognition of linear, surface, three dimensional and all pervasive awareness [12].

Results

Psychoeducation topics (groups A and B)

The study adopted an interactive approach to the delivery of the topics covered during psychoeducation. We gave a brief lecture about the topic and then opened it up for discussion. Inmates were at liberty to discuss the topic using any language they were comfortable with. However, most inmates either used English, Bemba, Nyanja or Tonga (our observations). Our role during group sessions was to briefly introduce the topic in form of a lecture and then subject it to discussion. Group psychoeducation involved group psychotherapy in which group interaction was encouraged in order to help inmates modify their behaviour and overcome problems in desired ways [13]. It aimed at improving inmate's individual wellbeing and mental health, to resolve or mitigate HIV risk behaviours, beliefs, compulsions, thoughts or emotions and to improve relationships and social skills.

Process evaluation data included: MINI international neuro-psychiatric interview (at 0 and 6 weeks). The HIV risk taking behavioural scale (at 0 and 6 weeks) and 3). The Warwick-Edinburgh mental wellbeing scale (at 0 and 6 weeks).

Results: Results were divided into two, before and after interventions. Before intervention was at zero weeks and after intervention at six weeks.

Socio demographic characteristics: Majority were from the age range 20-35 years (N=9) followed by 46-65 years (N=8) and 36-65 years (N=6) respectively. The marital status indicated that majority were single with distribution of 12 respondents in total from the three groups, followed by married 7. Widowed and divorced were 3 and 2 each respectively. Most of the inmates were incarcerated for violent crimes (21) with many of them being first offenders (22).

Mental health: After assessing the prevalence of psychiatric disorders among inmates in study 1, psychotic disorders current was targeted for intervention. All participants were diagnosed with current psychotic disorders [14]. Interventions were thus made to assess the prognosis of the condition and HIV behavioural-risk factors. Each participant's clinical features present during the assessment before and after the intervention were recorded, indicates clinical diagnostic features present during the administration of the MINI at enrolment (before intervention) which were statistically compared with after intervention (Table 1).

Group	Participant's ID	Clinical psychotic features present
A	AS 01-LCCF	1st person auditory hallucinations, bizarre delusions, disorganised speech and thought broadcast
	JCL 02-LCCF	Disorganised speech, poor judgement, lack of insight, thought insertion and delusions of reference,
	MM 03-LCCF	Visual hallucinations, thought broadcast, delusions of reference and 3rd person auditory hallucinations

	BP 05-LCCF	Nihilistic delusions, visual hallucinations, flight of ideas and disorganised speech
	AS 06-LCCF	Persecutory delusions, disorganised speech, circumstantiality, loosening of association, thought broadcast and 3rd person auditory hallucinations
	JC 07-LCCF	3rd person auditory hallucinations, thought insertion, disorganised behaviour, aggressive and violent behaviour, poor insight and judgement
	FS 08-LCCF	Disorganised speech, lack of insight, 1st person hallucinations, paranoid delusions and thought broadcast
	FM 09-LCCF	Auditory hallucinations, bizarre delusions and thought insertion
	Hi	
B	EC 01-LCCF	Flight of ideas, delusions of jealousy and grandiose, disorganised speech, circumstantiality and lack of insight
	AP 02-LCCF	Disorganised speech, catatonic behaviour, lack of insight and nihilistic delusions
	AH 03-LCCF	Catatonic behaviour, blunted affect, disorganised speech, word salad and perseveration
	JM 04-LCCF	Visual hallucinations, bizarre delusions, auditory hallucinations and thought broadcast
	FM 05-LCCF	Flight of ideas, bizarre delusions and auditory hallucinations
	MM 06-LCCF	Visual hallucinations, bizarre delusions and disorganised speech
	MM 07-LCCF	Thought broadcast, alogia and auditory hallucinations
	CM 08-LCCF	Auditory hallucinations, thought broadcast and lack of insight
C	LC 01-MM	Disorganised speech, perseveration, auditory hallucinations, bizarre delusions, circumstantiality, illusions, loosening of associations and catatonic behaviour
	AP 02-MM	Auditory hallucinations, amnesia and bizarre delusions,
	EM 03-MM	1st person hallucination, apathy, delusions and poor insight
	GM 04-MM	Auditory hallucinations, flat affect and bizarre delusions
	CC 05-MM	Memory impairment, bizarre delusions and auditory hallucinations
	JM 06-MM	Visual and auditory hallucinations, thought insertion, catatonic behaviour, disorganised speech, word salad and incoherent speech
	JM 07-MM	Disorganised speech, flight of ideas, circumstantiality, bizarre delusions and blunted affect
	LK 08-MM	Bizarre delusions, catatonic behaviour and disorganised speech

Table 1: Psychotic symptomatology across all groups before intervention.

Before the intervention, 24 inmates were diagnosed with current psychotic disorders from all the three groups. However, after the intervention, the number reduced by 11 (50%). Significant reductions came from groups A and B. In group A, 7 inmates became asymptomatic and only 1 remained symptomatic, in group B, 5 were asymptomatic and 3 remained symptomatic with changes in group C being insignificant (only 1 was asymptomatic and 7 symptomatic).

That is, while there is an overall change in the number of inmates with the disorder, group C remained the same, implying that the intervention in groups A and B was associated with positive and effective outcome. The key finding was that positive effects of the intervention were mostly among those in group A. Each participant had all major clinical psychotic features present during the assessment recorded. (Table 2) indicates clinical features present during the administration of the MINI at end-line measure (at six weeks after intervention follow-up).

Group	Participant's ID	Clinical psychotic features (Prognosis)
A	AS 01-LCCF	Asymptomatic
	JCL 02-LCCF	Asymptomatic
	MM 03-LCCF	Asymptomatic
	BP 05-LCCF	Asymptomatic
	AS 06-LCCF	Asymptomatic
	JC 07-LCCF	Asymptomatic
	FS 08-LCCF	Asymptomatic
	FM 09-LCCF	Auditory hallucinations, bizarre delusions and thought insertion
B	EC 01-LCCF	Flight of ideas, delusions of jealousy and grandiose
	AP 02-LCCF	Asymptomatic
	AH 03-LCCF	Asymptomatic
	JM 04-LCCF	Asymptomatic
	FM 05-LCCF	Asymptomatic
	MM 06-LCCF	Visual hallucinations, bizarre delusions
	MM 07-LCCF	Asymptomatic
	CM 08-LCCF	Auditory hallucinations and bizarre delusions
C	LC 01-MM	Perseveration and bizarre delusions
	AP 02-MM	Asymptomatic
	EM 03-MM	1st person hallucination, apathy, delusions
	GM 04-MM	Auditory hallucinations and bizarre delusions
	CC 05-MM	Bizarre delusions and auditory hallucinations
	JM 06-MM	Auditory hallucinations, thought insertion, disorganised speech,
	JM 07-MM	Flight of ideas, circumstantiality, bizarre delusions
	LK 08-MM	Bizarre delusions, catatonic behaviour and disorganised speech

Table 2: Psychotic symptomatology across all groups after intervention (End-line measure).

Inmates' mental wellbeing after intervention: Results show that after intervention, inmates' mental wellbeing tremendously improved in A and B except group C, which received antipsychotics only. Group A indicated a statistically higher improvement with 94.71% change

compared to groups B, 44.2% and C, 15.25% respectively. Within groups, group A indicated a high improvement in mental wellbeing followed by groups B and C respectively. Therefore, the intervention in group A resulted in a positive outcome to the inmate's mental wellbeing

HIV prevalence and risk factors before and after intervention: HIV status results, 23 inmates had tested for HIV. Of these, 9 (38%) were HIV positive and 14 (58%) were negative. In addition, group C had the most inmates who were HIV positive. The HRBS scoring was as follows: For each of the two sub-sections merely added up the score for each of the questions; for the total score, added up the two sub-totals. The HRBS provided three scores: a total score indicates level of HIV risk taking behaviour; a drug use sub-total indicates level of risk due to drug taking practices; and a sexual behaviour sub-total indicates level of risk associated with unsafe sex. In all cases the higher the score, the greater the risk the inmate had of contracting and passing on HIV. All were scored on 0-5 scale, with a higher score indicating a higher degree of risk-taking. These scores were added up to provide measures of drug use risk taking behaviour, sexual risk taking behaviour and a global HIV risk taking behaviour score. Results show that sexual risk behaviour was higher in all the groups as a whole, compared to drug risk behaviour. Thus, sexual behaviour posed a higher risk challenge for HIV infection in inmates than drug use. Inmates were asked whether they had shared shaving or tattooing instruments while in incarceration. 40 percentages of these said they had shared either instrument, while 60 percentages responded otherwise. However, only two respondents admitted to having tattooed while in prison. The HIV status remained almost unchanged after intervention, except one more inmates had tested, hence increasing the number of those HIV positive. In addition, three inmates admitted to having shared shaving or tattooing instrument and one tattooed within the time of intervention delivery from group C.

HIV risk behaviours

Drug use and sexual behaviour after intervention: After intervention, HIV sexual risk behaviour was reduced. Both groups; A and B had HIV sexual risk behaviour eradicated compared to C, which received antipsychotics only as an intervention. Nevertheless, in group C, the effect of sexual behaviour only worsened compared to results before intervention. HIV sexual risk behavioural factor, that is, men who had sex with men, was not reported after intervention in groups A and B.

Discussion

Follow up study provided a comprehensive intervention package that may help reduce psychotic symptoms and improve mental wellbeing in inmates with psychotic disorders and those living with HIV. All inmates diagnosed with current psychotic disorders were never screened for psychiatric disorders during incarceration and were therefore not on any form of treatment. There was no recorded case of drug use both before and after intervention. This was due to the stringent exclusion criteria. All the presenting psychotic symptoms for each inmate were recorded at enrolment (0 weeks) and reassessed for prognosis after intervention (at 6 weeks) in all the groups.

Results showed that inmates' in group A had fewer psychotic features compared to groups B and C, improved mental wellbeing and there was reduction in HIV related behavioural risk factors. 7 out of 8 inmates in group A became asymptomatic after six weeks of receiving the intervention package. Seven inmates in group A registered a positive prognosis; their major clinical symptoms disappeared.

Overall, results showed that positive effects of the intervention were mostly among those in group A. This is to indicate that mindfulness practice might have a relationship with positive influence

in the management of psychotic disorders, promoting a positive mental wellbeing and the general wellbeing of inmates with mental problems. Cyclic meditation and regulated breathing techniques could have a positive influence in the management of psychotic disorders and mental wellbeing. If practised regularly and consistently, Cyclic meditation may have the potential to improve cognitive functions which are impaired in psychotic disorders such as memory deficits, lack of attention, poor judgement and lack of insight. The practice allows more blood supply to the brain and regulated breathing techniques helps to calm down the mind making inmates have control over their minds.

Group B showed some statistical improvement with psychotic symptoms and mental wellbeing compared to C. Group C, did not register any statistical improvement in most of the assessed spheres. Results may suggest that pharmacological therapy alone may not be enough to comprehensively manage psychotic disorders and improve mental wellbeing. If combined with cyclic meditation, regulated breathing techniques and group psychoeducation, improvements maybe statistically significant. The second intervention package with good prognosis, but not as effective as first one, is the combination of anti-psychotic therapy and group psychoeducation. This combination received by group B showed good results but not as effective as compared to group A. Results may therefore suggest that the common clinical practice of providing antipsychotic drugs only to inmates with psychotic disorders may not be adequate to eliminate psychotic features and improve mental wellbeing.

Despite the substantial burden of illness in psychotic disorders, there has been a discrepancy between the beneficial effects of an increased use of antipsychotic medications and achieving limited recovery or remission. Because the focus of most common antipsychotic medications is on dopamine, which is associated with positive symptoms (e.g., in Schizophrenia), there is an unmet need for patients with negative symptoms. Since cognitive and negative symptoms rather than positive symptoms are more closely associated with psychosocial impairments in patients with psychotic disorders (e.g. Schizophrenia), the non-dopaminergic systems including Glutamate and γ -Aminobutyric Acid (GABA) of the prefrontal cortex should be of concern as well. The balance of excitation and inhibition has been associated with epigenetic modifications and thus can be analysed in terms of a neurodevelopmental and neural circuitry perspective. Hence, a novel bio-psychosocial behavioural model for the treatment of psychotic disorders is needed to account for the non-dopaminergic systems involved in psychotic disorders, rather than dopaminergic mechanisms. This model can be understood from the viewpoint of neurodevelopment and neural circuitry and should include the staging care, personalized care, preventive care, reducing the cognitive deficits and reducing stigma within the correctional facility environment.

Despite this being a "golden age of psychopharmacology"¹¹, there is a discrepancy between the beneficial effects of psychotropic medications and the lack of improvement for people with psychotic disorders. Despite the revolutionary advances in genomics and neuroscience in the realm of clinical psychiatry, the diagnostic methods for psychotic disorders remain relatively unchanged. Diagnosing psychotic disorders not by the underlying biological underpinnings but by consensus on symptoms may be associated with significant heterogeneity in the clinical course and diversity in treatment responses to antipsychotics. Instead, clinical targets should be changed from symptoms to biomarkers or end phenotypes and

clinical treatments should be more sophisticated and individualized. This would be in accordance with our improving understanding of psychotic disorders (e.g., Schizophrenia), from a disease caused by a chemical imbalance to one caused by dysfunctional circuitry. In terms of deconstructing the Kraepelinian dualism of psychoses, a combination of categorical and dimensional representations of psychopathology has been proposed to present the symptoms of affective psychosis and non-affective psychosis.

The pathogenesis of psychotic disorders, a broad range of genetic, environmental risk factors and their interactions can alter many distinct neurotransmitter circuits, leading to the characteristic cognitive, behavioural and social dysfunctions of the disease. In a model of interlocking nodes with a central hub, representing oxidative balance and the immune system as inputs to the glutamatergic system, imbalance in any of these nodes can affect the entire system. Focused on cognitive and/or negative symptoms, has defined the stages of psychotic disorders (schizophrenia) as follows: Stage I is characterized by genetic vulnerability and environmental exposure, possibility of being diagnosed with genetic sequence and family history and little to no cognitive deficit. Stage II is characterized by the features of cognitive, behavioural and social deterioration, help seeking, being diagnosed through cognitive assessment, neuroimaging and the structured interview for prodromal syndrome. Interventions at this stage could include cognitive training, treatment with polysaturated fatty acids and social support. Stage III is characterized by the features of abnormal thought and behaviour and relapsing-remitting course, as revealed through clinical interview, the loss of insight into one's condition, being intervened with medications and psychosocial interventions. Lastly, stage IV is marked by continued deterioration, unemployment and homelessness, medical complications and incarceration. Interventions are medication, psychosocial interventions and rehabilitation services.

Mental wellbeing after intervention

After the intervention, inmates' mental wellbeing tremendously improved except for group C. Group A indicated a statistically significant and high improvement in mental wellbeing with a 94.71% change compared to groups B 44.2% and C 15.25% respectively. Within groups, group A indicated high improvement in mental wellbeing followed by groups B and C respectively. Therefore, the intervention may have registered positive outcomes to the inmate's mental wellbeing. It can be suggested that after intervention, mental wellbeing in groups A and partially B may have improved because of the intervention received. The WEMWBS with cut-off point of 50.7 was used to measure mental wellbeing and it measured different domains of mental wellbeing. Mental wellbeing is now largely accepted as covering two perspectives: The subjective experience of happiness (affect) and life satisfaction (the hedonic perspective) and (2) positive psychological functioning, good relationships with others and self-realization (the eudaimonic perspective). The latter includes the capacity for self-development, positive relations with others, autonomy, self-acceptance and competence.

There is evidence that mental wellbeing is a good indicator of how people and populations are able to function and thrive. Findings of the current study suggest that after intervention, inmates' mental wellbeing improved in all domains for group A. Mental wellbeing relates to a person's psychological functioning, life-satisfaction and ability to develop and maintain mutually benefiting relationships. Psychological wellbeing includes the ability to maintain a sense of

autonomy, self-acceptance, personal growth, purpose in life and self-esteem. Staying mentally healthy is more than treating or preventing psychiatric disorders.

HIV risk-behaviour after intervention

Compared to before and after intervention results, all groups were aware of their HIV status, however, groups A and B showed statistically significant improvements compared to C. In addition, group C had most inmates who were HIV positive. Results showed that sexual risk-behaviours, (Men who had Sex with Men) were the highest vice in the three groups combined. Thus, sexual behaviour poses a more risk challenge for HIV infection in inmates.

Just like in study 1, follow-up study still found a high HIV prevalence of 41.6%. Before intervention, the prevalence was 38% and after intervention, it increased to 41.6%. The increase was because of an inmate who did not test for HIV before the intervention and decided to test after the intervention. The decision to test could have come after receiving information about HIV during psychoeducation sessions. The inmate tested positive hence the increase in the rate. The HIV risk factors identified included; Men who had sex with Men (MSM), sharing of shaving or tattooing instruments and tattooing. After intervention, HIV sexual risk behaviour reduced. That is both groups; A and B had HIV sexual risk behaviour eradicated compared to C, which received antipsychotics only as an intervention. The eradication of sexual risk behaviours in groups A and B maybe is attributed to mindfulness practice, which helps in mind control and calming down the mind. Another contributing factor could be psychoeducation.

Results therefore suggest that antipsychotics and HAART alone may not help in eradicating HIV related risk behaviours in patients with psychiatric disorders. Group psychoeducation and mindfulness practice may have positive and effective influence in reducing behavioural HIV risk factors. After intervention, participants in groups A and B had stopped sharing of shaving and tattooing instruments, MSM was not as prevalent as earlier recorded before intervention. Results showed that interventions in groups A and B had statistically significant and positive effects in eradicating HIV risk behaviour. This is an important indication that behavioural modification is key in reducing HIV risk factors. A combination of cyclic meditation, regulated breathing techniques and group psychoeducation could have the potential in alleviating psychotic symptoms and eradicating HIV risk behaviours among inmates. This is evident from results in group C which received antipsychotic drugs only. Not only did their HIV behavioural risk factors not improve, but they worsened. Groups A recorded less, almost insignificant HIV risk factors compared to B and C.

Mindfulness practice

Group A received mindfulness practice twice weekly for six weeks follow-up. At the end of six weeks follow-up, seven out of eight inmates had their psychotic clinical features eliminated; improved mental wellbeing and reduced HIV risk behaviour. Three inmates were released, one transferred because of a good prognosis and most of them recommended for transfer to Chainama east mental hospital correctional facility for continued treatment. Just like the pilot assessment of mindfulness practice in socio-epidemiological assessment, follow-up study results suggest that mindfulness practice combined with antipsychotic medications and group psychoeducation

could have a more effective positive result than a combination of antipsychotics and group psychoeducation or the provision of antipsychotics alone.

Research has found mindfulness practice to be an effective tool in managing and preventing psychiatric disorders such as depression, anxiety, stress and aggressive behaviour with improved cognitive functions (executive functions). In another study, results indicate that after teaching eight incarcerated inmate women in Perth, Australia correctional facility once a week for 8 months' results indicated positive influence. After yoga practice for 8 months, all the eight women reported improvement in their physical health, flexibility and levels of relaxation and concentration. The participants reported to the researcher that because of yoga classes, they were more nurturing, had time for themselves and deep feelings of satisfaction and contentment (improved mental wellbeing).

A growing number of clinical studies have demonstrated that breathing including meditation may represent a new non-pharmacological approach for improving specific aspects of attention. Mindfulness, for instance, contributes to alerting and orienting, but conflicts with monitoring. In addition, an 8 weeks mindfulness based stress reduction yielded a larger effect than a 1 month intensive mindfulness retreat, on the attention altering component. Three months of intensive focused attention meditation have been found to reduce variability in attentional processing of target tones and to enhance attentional task performance. Some studies have investigated cognitive and emotional improvement simultaneously and have indicated that a brief mental training could enhance sustained attention as well as reduce fatigue and anxiety. Some researchers believe that the relaxation generated by peaceful breathing helped to manage inattention symptoms among children with attention deficit-hyperactivity disorder.

Comparison to international studies

When compared to international studies, findings are similar. Studies globally have indicated a significant positive effect of mindfulness practice in alleviating psychiatric disorder's clinical features and improving mental wellbeing among inmates and the general population. Research has found Yoga to be an effective tool in managing and preventing mental health disorders such as depression, anxiety, stress and aggressive behaviour with improved cognitive functions (executive functions). Yoga is a science, which uses these techniques to achieve control over the changes of the mind and thereby balances an individual's lifestyle. This is important in the management and prevention of psychiatric disorders and HIV among inmates. Antipsychotics only relieve the patient of the physical symptoms without addressing the real cause. Yoga on the other hand, has been found to be very effective to manage an individual holistically

Comparisons to Zambian studies

There is currently no known intervention studies of this nature ever conducted in the Zambian correctional facilities. Most of the studies' interventions have targeted HIV prevention or simply determining the prevalence of Mood Affective Disorders among inmates.

Conclusion

Results provided some preliminary efficacy data on the interventions for the current study. It has been demonstrated that

combination therapy among inmates may positively influence the improvement of mental wellbeing, thereby enhancing cognitive functions. Inmates with mental health problems may greatly benefit from regular cyclic meditation and regulated breathing technique practice. The current research suggests a similar study for female inmates who are currently practicing yoga at Lusaka correctional facility. It may be deduced from the results that pharmacotherapy, mindfulness practice and psychoeducation could be more effective and helpful in ameliorating mental health and HIV risk behaviour than any other monotherapy. On the other hand, despite adequate provision of HIV information and health care services to inmates, prevalence of HIV has steadily remained high. This is an indication that current interventions may have not addressed the problem holistically. The provision of information alone may not be adequate to address HIV behavioural risk factors.

Limitations

Follow-up study did not have female inmates. The Zambia correctional service system houses male and female inmates in separate facilities and as such, could not be allowed to mix during mindfulness practice. Another limitation was the fact that the study could not follow up participants after end line measure. Inmates were supposed to be followed up at twelve weeks to assess for continuity practice of mindfulness therapy. This was due to the releases and transfers of inmates whose prognosis had improved and responded well to the intervention, especially group A inmates. The sample size was too small and the fact that this was a pilot study, results may have limited generalizability.

This is among the first ever known studies to introduce an innovative combination of pharmacological and non-pharmacological therapy for people with psychotic disorders, mental health problems and HIV. The findings may provide evidence on the effectiveness of combination therapy comprising Antipsychotic drugs, cyclic meditation, regulated breathing techniques and psychoeducation in the management of psychotic disorders, improving general mental wellbeing and reducing HIV risk behaviour among inmates.

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