BIRTH DATES AND ADMISSION DATES IN SCHIZOPHRENIA AND BIPOLAR DISORDER

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The well established phenomenon of seasonality of birth dates (winter excess) and admission dates (summer excess) of patients with schizophrenia and bipolar disorder was re-examined in a Southern African study of in-patients. Monthly and seasonal analyses respectively resulted in a May (late autumn and winter) excess of schizophrenic male births and a March (late summer and autumn) excess among schizophrenic females, which revealed a gender difference. Bipolar births peaked in May (autumn). Admission rates peaked in May (late autumn) for schizophrenic patients and in March (early autumn) for bipolar patients. Birth rates peaked one season earlier but admission rates one season later than in previous studies. The apparent coincidence of the birth and admission peaks among patients with schizophrenia and bipolar disorder suggests that these patients are more often admitted around their birthdays. This concurrence remains to be tested.

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Introduction

Previous studies indicated the following: Schizophrenic patients are born more often in winter and early spring (Bradbury & Miller, 1985; Dalén, 1988; O'Callaghan et al, 1991; Pulver et al, 1992a; Sacchetti et al, 1992). Patients with bipolar disorder show a similar distribution (Boyd et al, 1986; Sacchetti et al, 1992). Admission of schizophrenic patients to psychiatric hospitals occurs more often in summer (Hare & Walter, 1978), especially in female schizophrenic patients (Takei et al, 1992). Manic patients are admitted more often during spring and summer (Sayer et al, 1991; Jain et al, 1992; Takei et al, 1992). As in Northern Hemisphere studies, Mulder et al (1990) and Sayer et al (1991) demonstrated a peak admission rate in spring and summer for mania in New Zealand. Previous studies on admission dates in Southern Africa could not be found. Studies on birth dates were also conducted more often in the Northern than in the Southern Hemisphere (Bradbury & Miller, 1985). Only one study concerning birth dates of schizophrenic patients could be found in a Southern African context but it excluded non-caucasian patients (Dalén, 1975).

The association between schizophrenic births and winter has aetiological relevance and various hypotheses to explain this association exist:

i) The harmful effects hypothesis: A seasonal factor may damage the central nervous system during intra-uterine life or the first postnatal months and may increase the risk for schizophrenia. Such a factor may be a virus (e.g. influenza

virus), a low protein diet, complications during pregnancy or parturition, low temperatures or a pollution factor in the environment (Bradbury & Miller, 1985; Boyd et al, 1986; Barr et al, 1990; Kendell & Adams, 1991; Pulver et al, 1992a). Crow & Done (1992) presented arguments against the influenza theory. The harmful effects hypothesis is supported by evidence that schizophrenic patients born in winter more often have enlarged cerebral ventricles although some studies suggest that these patients belong to the specific subgroup of schizophrenic patients without a family history (Murray et al, 1985; Sacchetti et al, 1992).

ii) The genetic fitness or advantage hypothesis: Persons with a genetic risk for schizophrenia may have biological protection against allergies and infections which occur more often in winter. The mortality of these children born in winter is thus lower (Bradbury & Miller, 1985; Pulver et al, 1992a).

iii) The procreative habits hypothesis: Mothers of schizophrenic patients (mothers carrying the schizophrenic genotype) more often fall pregnant in spring and early summer. The absence of a seasonal pattern in the births of healthy siblings of schizophrenic patients makes this a less tenable hypothesis (Bradbury & Miller, 1985; Boyd et al, 1986; Pulver et al, 1992b).

iv) A fragile association among high maternal age, births in winter and schizophrenia was found by Dalén (1988).

v) The stress-diathesis hypothesis: Environmental factors (like a seasonally varying viral insult) interact with genetic vulnerability for schizophrenia (Baron & Gruen, 1988; Pulver et al, 1992a). There seems to be conflicting evidence regarding the association between season of birth and genetic risk or family history. Some studies report a greater seasonality effect where the familial loading of the disorder is high (Baron & Gruen, 1988) while others report the opposite (O'Callaghan et al, 1991). Some studies found different seasonal patterns for patients with and

without a family history (O'Callaghan et al, 1991; Pulver et al, 1992a).

The parents of patients with bipolar disorder have also been said to conceive more often in spring or early summer (Boyd et al, 1986). One study in the Northern Hemisphere found an increased familial risk in manic-depressive patients born in the first quarter of the year, corresponding to winter and early spring (Boyd et al, 1986). Unlike in schizophrenia, no definite association between season of birth and central or cortical atrophy of the brain has been found for patients with major affective disorders (Sacchetti et al, 1992).

Explanations for the seasonality of admissions for schizophrenia and bipolar disorder include factors like luminance and day length (Carney et al, 1988), an inverse effect of humidity and an influence of temperature (Takei et al, 1992, 1993). The latter has also been related to latitude (Jain et al, 1992). The seasonality of admissions and its explanatory theories might shed some light on the aetiology of these conditions. The aim of this study was to identify peak frequencies of month and season of birth, as well as month and season of admission among in-patients with schizophrenia and bipolar disorder in a Southern African context.

Method

This descriptive study was conducted over the weekend of 3-6 September 1993 at the Weskoppies Hospital in Pretoria (the psychiatric hospital affiliated to the University of Pretoria). A weekend was chosen to limit patient movement to the minimum and to obtain a "momentary" sample. Three days were necessary to collect the data since the clinical and admission notes are not yet computerized. Clinical notes of all the in-patients (n=1046) were examined for DSM-III-R diagnoses of schizophrenia and bipolar disorder. The birth date, the most recent admission date, file number, sex and race were obtained. This sampling method was chosen since no regional or national

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data base with the required information exists in South Africa. Patients who were sent to the hospital in pursuance of the criminal procedures act for determination of the presence of any mental disorder were excluded from all analyses because a diagnosis is only assigned when the patient is discharged for continued court procedure. Schizophrenic and bipolar patients who were readmitted to the hospital in pursuance of the criminal procedures act after a mental disorder was confirmed (n=152), were excluded from the admission date analysis because these dates depended on court procedure rather than on the onset of the disorder. Schizophrenic and bipolar patients without a known birth date (n=78) were excluded from the birth date analysis. It has been taken into account that the admissions date back several decades with a marked increase of admissions in the few months just before the sample time. The admissions accounting for this increase could cause an artefact due to the choice of the sampling time, and were therefore excluded well before the start of the slope. Thus, the "youngest" 33.3% of admissions were excluded, yielding 262 patients for the study. To ensure that this exclusion of dates was adequate, the analysis was repeated excluding the "youngest" 50% of the admissions. The same significant peaks emerged, suggesting that the potential artefact was successfully avoided.

The data was analysed using the z-test for ratios. This one-tailed test verified whether the calculated ratio was significantly greater than the expected ratio. The calculated ratio was obtained by dividing the number of births (or admissions) for each month (or season) by the total number of births (or admissions). The z-value is equivalent to the square root of the chi-square value. To translate the monthly results into seasons, all permutations of consecutive three-month periods were investigated. This provided 12 permutations where each season could start on two other possible months. In Southern Africa
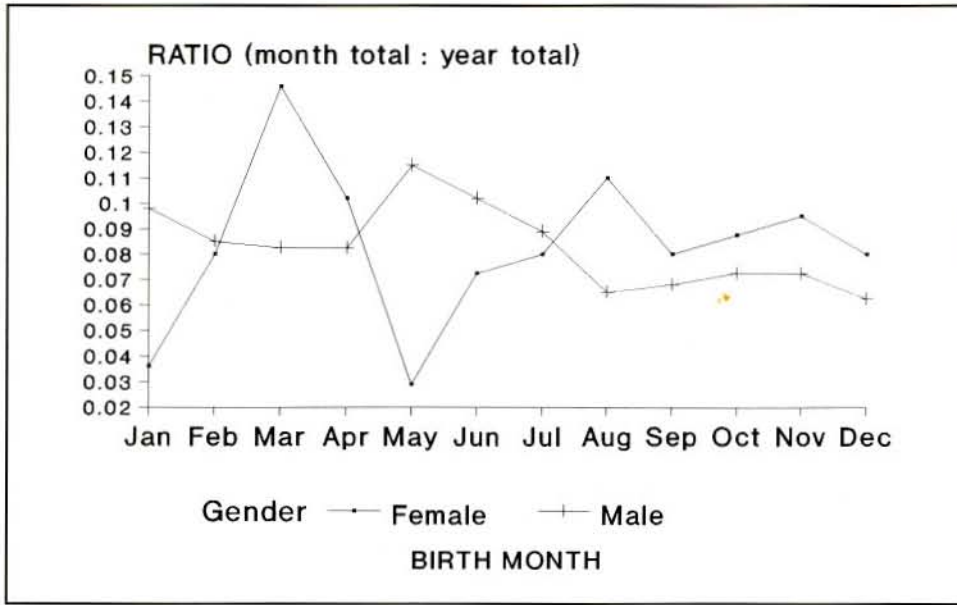
summer conventionally starts in December but this study permitted also for summer commencing in November or January.
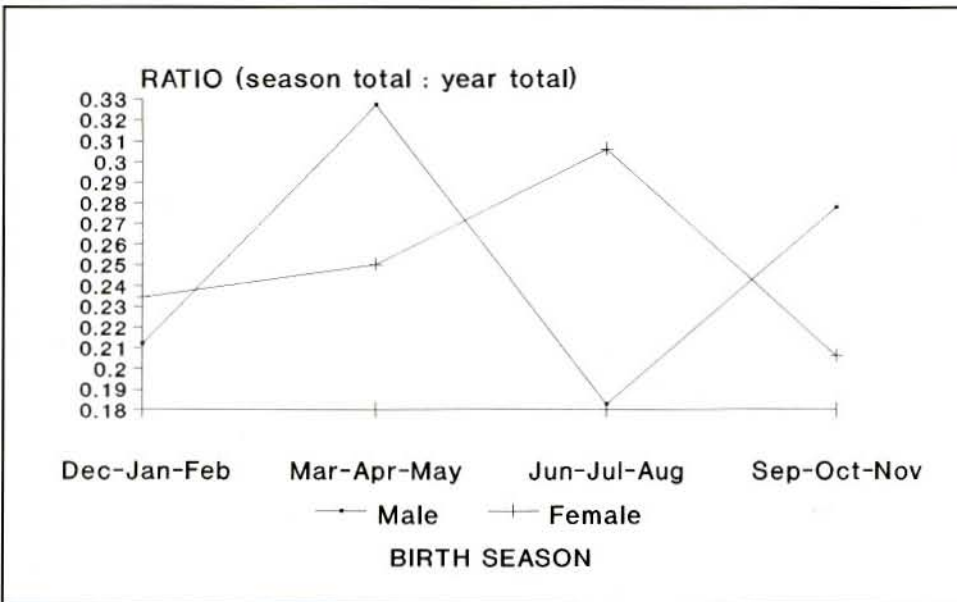
Results

Birth dates:
The results reported were limited to statistically significant peaks. The monthly analysis of all schizophrenic patients (n=440) showed no statistically significant distribution for month of birth. When subgroups of gender were considered schizophrenic males (n=303) showed a statistically significant peak of births in May (z=2.027, p=0.021) while schizophrenic females (n=137) showed a statistically highly significant peak of births in March (z=2.653, p=0.004) (Figure 1). This gender difference was confirmed among schizophrenic caucasian and non-caucasian patients respectively. Schizophrenic caucasian males (n=155) showed a highly significant peak of births in May (z=2.93, p=0.0017) while schizophrenic caucasian females (n=98) showed a significant peak of births in March (z=2.132, p=0.017). The births of schizophrenic non-caucasian males (n=148) peaked highly significantly in June (z=2.875, p=0.002) while the births of schizophrenic non-caucasian females (n=39) peaked non-significantly in March (z=1.593, p=0.056). The seasonal analysis of all schizophrenic patients demonstrated no statistically significant distribution. Schizophrenic male births were concentrated statistically significantly in the season May-June-July which corresponds to late autumn and winter (z=2.289, p=0.011). Schizophrenic female births were concentrated in the season February-March-April which corresponds to late summer and autumn (z=2.12, p=0.017) (Figure 2).

In the analysis of birth months, bipolar patients (n=26) emerged with a highly significant peak in May (z=2.72, p=0.0033) (Figure 3). Bipolar males (n=15) were born more often in October

RATIO (month total : year total)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Gender ·— Female —+— Male

BIRTH MONTH

Figure 1 : Birth month ratios vs birth month for male and female schizophrenic patients

RATIO (season total : year total)

Dec-Jan-Feb   Mar-Apr-May   Jun-Jul-Aug   Sep-Oct-Nov

·— Male —+— Female

BIRTH SEASON

Figure 2 : Birth season ratios vs birth seasons for male and female schizophrenic patients

RATIO (month total : year total)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
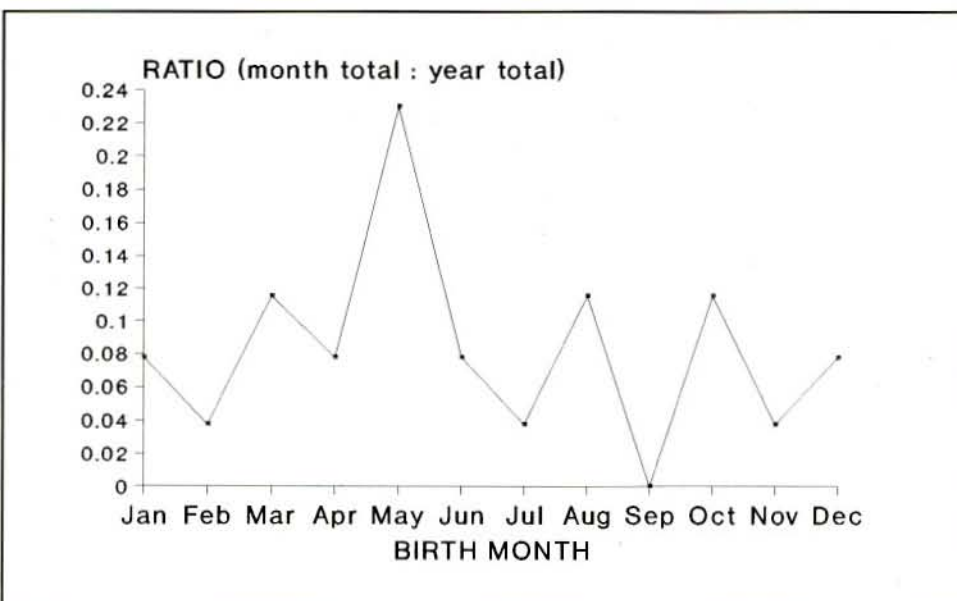
BIRTH MONTH

Figure 3 : Birth month ratios vs birth month for bipolar patients

just short of statistical significance (z=1.635, p=0.051) and the birth dates of females with bipolar disorder (n=11) peaked highly significantly in May (z=4.455, p=0.000004). Seasonal investigation of bipolar patients demonstrated an increased prevalence of births in the season March-April-May which is autumn (z=2.038, p=0.02) (Figure 4). Bipolar female births peaked highly significantly in the season May-June-July which corresponds to late autumn and winter (z=2.959, p=0.0015) but no significant peak emerged for bipolar males.

Admission dates

For the monthly analysis, a peak emerged for schizophrenic patients (n=251) in May (z=1.846, p=0.032) (Figure 5). The same peak was evident among the 158 schizophrenic males (z=1.679, p=0.047). Schizophrenic non-caucasian males (n=37) peaked highly significantly in June (z=2.925, p=0.0017) and caucasian males (n=121) in May (z=1.946, p=0.026). No significant distribution emerged for the 93 schizophrenic females. Bipolar patients (n=11) peaked in March (z=2.273, p=0.012). This peak was exceptionally evident among the 4 bipolar females

Figure 4 : Birth season ratios vs birth seasons for bipolar patients

RATIO (season total : year total)

BIRTH SEASON
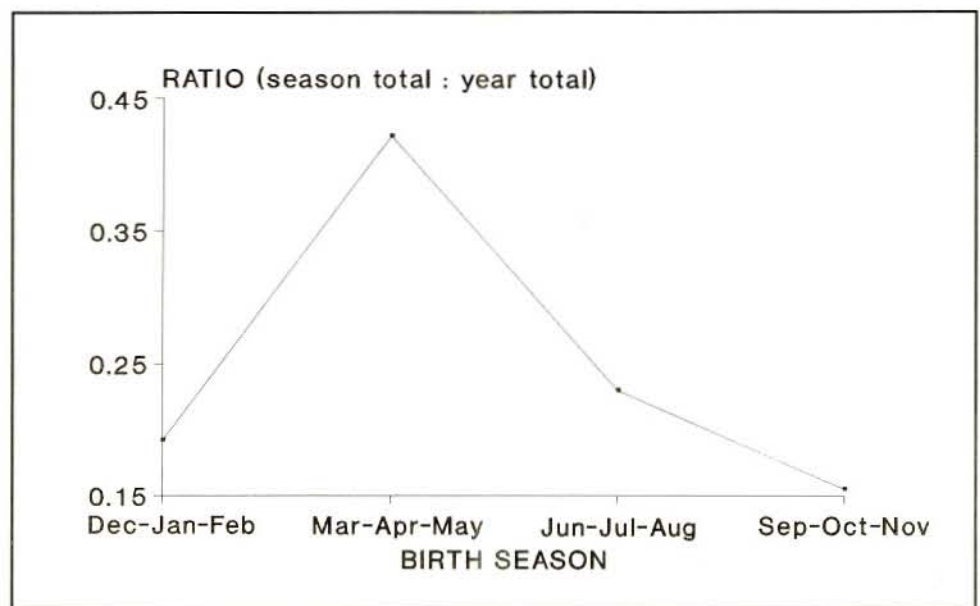
Figure 5 : Admission month ratios vs admission month for schizophrenic patients

RATIO (month total : year total)
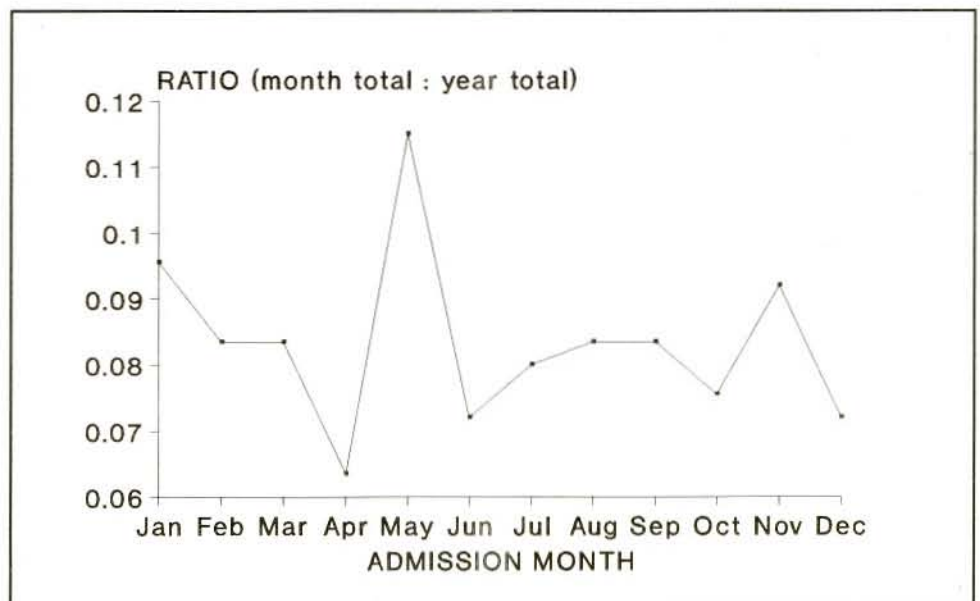
ADMISSION MONTH

(z=3.015, p=0.0013). No significant month distribution emerged for the 7 bipolar males. Seasonal investigation for schizophrenic and bipolar patients respectively revealed no significant patterns of admission. Bipolar females however peaked in the season January-February-March which corresponds to summer and early autumn (z=2.309, p=0.011). All the above calculations were repeated for the oldest 50% of the admission dates where the monthly analysis yielded the same peaks with more statistically significant p-values. Moreover, another statistically significant result was found in the seasonal analysis where 3 of 5 bipolar males were admitted in the season September-October-November which is spring (z=1.807, p=0.035).

Discussion

Birth dates

The schizophrenic birth date distribution without subgroup differentiation fell short of statistical significance and the peak of schizophrenic births in winter and early spring found in other studies (Bradbury & Miller, 1985; Dalén, 1988; O'Callaghan et al, 1991; Pulver et al, 1992a; Sacchetti et al, 1992) could therefore not be confirmed. Significant birth date distributions were found for gender. Males were born more often in May (and according to the seasonal analysis in late autumn and winter) and females more often in March (and according to the seasonal analysis in late summer and autumn). Although some studies had reported a higher birth rate in winter and early spring for male as well as female schizophrenic patients, other studies revealed a spring peak for females and a winter peak for males (Baron & Gruen, 1988). In this study however, the female birth date peak preceded the male peak by one season or according to the monthly analysis by two months. The non-caucasian males were born much more often in June which is a month later than the caucasian males and the

undivided male group. Translated into seasonal terms, autumn and winter delivered more caucasian males whereas the non-caucasian male births were concentrated in winter. The suggested gender difference in birth date distribution among schizophrenic patients is possibly one of several known gender differences including the premorbid history, age of onset, psychopathology, cognition, presence of deficit symptoms, left hemispheric dysfunction, neuroanatomy, course of the disorder, prognosis, response to neuroleptics and family morbidity risk (Goldstein et al, 1989, 1990; Castle & Murray, 1991; Takei et al, 1992; Wolyniec et al, 1992). The relevance of birth dates in the aetiology of schizophrenia has been well documented (see the introduction to this study). Factors associated with gender like sex chromosomes and hormones may be involved in the aetiology of schizophrenia via neurodevelopmental abnormalities (Castle & Murray, 1991). Gender also seems to be an important factor in the transmission of schizophrenia where the illness in males is considered to be less heritable than in females (Goldstein et al, 1990; Castle & Murray, 1991; Wolyniec et al, 1992). Pulver et al (1992a) examined the association among birth month, gender and familial risk in schizophrenia and found a higher risk for schizophrenia among first degree relatives of schizophrenic females born during February to May (late winter and spring) than of schizophrenic females born during October to January (autumn and winter). The same pattern was observed in males but only up to the age of 30. The March and May peaks (both in autumn) found for females and males respectively in our study correspond to the earlier season of the Pulver et al (1992a) study, which possibly implies a less heritable form of schizophrenia in Southern Africa. Another interpretation could be that in-patients belong to the subgroup with a lower familial risk since our study consisted of in-patients only.

In this study bipolar birth dates peaked

in May due to a high preponderance of female birth dates in this month while the male birth date distribution leaned towards October (spring). Seasonally transposed, the undifferentiated bipolar group showed a higher prevalence of births in autumn which is a season earlier than reported in the literature. Previous studies in the Northern Hemisphere found an excess of bipolar births in January to March and possibly in April, corresponding to winter and early spring as for schizophrenia (Boyd *et al*, 1986; Sacchetti *et al*, 1992). In this study the concurrence of birth date peaks in autumn and winter for bipolar as well as schizophrenic subgroups suggests a similar seasonal pattern of births in schizophrenia and bipolar disorder. Possible explanations for the same seasonal pattern of births in bipolar disorder and schizophrenia are that winter-borns represent a subtype of patients with an atypical psychosis who may be diagnosed either as manic or schizophrenic; or that these winter-born patients are given both diagnoses at different times; or that the season of birth phenomenon represents a necessary but not sufficient cause for both these disorders (Boyd *et al*, 1986). Although a gender difference among patients with bipolar disorder might be suggested in this study, the results were inconclusive.

Admission dates
Patients with schizophrenia were admitted more often in May (late autumn). The female subgroup had no statistically significant distribution while male admission dates peaked in May. Non-caucasian males differed by one month with a high admission rate in June (early winter). These contrast with the findings by Takei *et al* (1992) of a summer (July) peak in admissions for schizophrenic females in the absence of a significant distribution for males. The admissions of patients with bipolar disorder occurred predominantly in March (early autumn) especially among females. The peak for bipolar patients preceded the peak for schizophrenic patients by two months.

Seasonal analysis of admission dates yielded less valuable results than monthly analysis except for bipolar females who were admitted more frequently in summer and early autumn and bipolar males who were admitted more often in spring. Takei *et al* (1992) reported a summer peak for both sexes of bipolar patients while Sayer *et al* (1991) and Jain *et al* (1992) mention also spring without sex differentiation. Frangos (1980) and Rihmer (1980) found a bimodal distribution for bipolar patients with peaks in spring and autumn. Our study showed the same bimodality when admissions were separated for gender. Reasons for the gender difference in this study are unknown. The admission date peaks of the undifferentiated schizophrenic and bipolar patient groups occurred within the same season (autumn) in this study while Takei *et al* (1992, 1993) found the same in summer. Perhaps the difference of one season can be related to the degree of latitude. This might also be an explanation for the 2 months earlier peak for admissions in Scotland compared to the England and Wales results (Takei *et al*, 1992, 1993) and the lack of seasonality peri-equatorially (Jain *et al*, 1992). The notion that bipolar patients and schizophrenic females share an aetiological or precipitating factor due to concurrent peaks of admissions (Takei *et al*, 1992, 1993), could not be confirmed in this study. It can however be concluded that schizophrenia and bipolar disorder have similar seasonality patterns for admission dates and thus might have an aetiological or precipitating factor in common. The concurrence could be regarded as another brick in the interfacial wall between the two disorders.

The apparent coincidence of the peaks of birth dates and admission dates among patients with schizophrenia and bipolar disorder suggests that these patients are more often admitted around their birthdays. This concurrence remains to be tested. Comparisons of this study with others should be done with caution since different study designs were used. This descriptive study provides a perspective

on in-patients as subgroups of patients with schizophrenia and bipolar disorder respectively with limited extrapolative value for out-patients. Alternatively designed studies which include out-patients would yield greater numbers of especially bipolar patients and more reliable statistical inference. It is noteworthy that this study included bipolar patients regardless of whether admitted as manic or depressed and also included readmissions. The patients included in the admission date analysis also represent only a subgroup because they were those who needed a longer period of hospitalisation. Although the validity of this cross-sectional study is increased by using *all* possible patient data at one location, an epidemiological design in Southern Africa would improve validity, using then regional and national data where the birth dates are controlled with the general population, and where admission dates are sampled for *all* admissions in multiples of 12 month periods. Nevertheless, the subject of seasonality, re-examined in this study in a Southern African context, provides for further causal and contextual exploration and can reflect interactive systemic functioning in the genesis of this phenomenon.□

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changed their preference from tricyclic antidepressants (clomipramine) to selective serotonin reuptake inhibitors. Under the condition of a more severe precipitating event in the case of adjustment disorder, the experts were more likely to recommend both formal psychosocial intervention and medication.

CONCLUSION

Studies indicate that persons with anxiety disorder seek treatment from general medical facilities as often as they do from mental health care settings. Yet primary care providers often do not recognize and treat these individuals effectively, perhaps because anxiety disorders present differently in the general health setting. In light of this situation, there is a need to disseminate efficacious treatment approaches to primary care settings. The presentation of anxiety disorders in primary care, how to improve recognition of anxiety and depression in primary care, and treatment strategies for primary care providers are of paramount importance. ◻

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