Frequency and pattern of radiological and laboratory investigations in patients with mental illnesses: A study from North Rajasthan

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ABSTRACT

Background: There are widespread perceptions that excessive and unnecessary investigations are done in many patients with mental illnesses. There are no studies from India looking into this issue.

Aims: (i) To study the frequency and pattern of various investigations such as electroencephalography (EEG), computerized tomography (CT) scan of head, magnetic resolution imaging (MRI) scan of brain, and blood investigations carried out by the previous doctors on patients seeking treatment in three different settings. (ii) To study the socio-demographic and clinical correlates of investigations carried out on these patients.

Study Design and Settings: A cross-sectional study in a community outreach clinic, a district level psychiatric hospital, and psychiatry outpatient clinic of a medical college.

Materials and Methods: 160 newly registered patients seeking treatment at these settings were assessed using a semi-structured pro forma regarding various investigations that they had undergone before seeking the current consultation. Frequency of investigations was analyzed.

Results: About 47.5% of patients had at least one of the three brain investigations done. EEG, CT head, and MRI brain had been done in 37.5%, 20.0%, and 8.8% of the patients, respectively. Only 1.8% of the patients had blood tests done before current consultation.

Conclusion: This study results raise question whether certain investigations such as EEG and CT head were carried out excessively and blood investigations were done infrequently. Further studies on larger samples with prospective study design to evaluate the appropriateness of current practices of carrying out investigations in patients presenting with psychiatric symptoms are required.

Key words: Computerized tomography-head, electroencephalography, investigations, laboratory tests, magnetic resolution imaging brain, mental illnesses, mentally ill patients

INTRODUCTION

Investigations are carried out in clinical practice either to confirm a diagnosis or to sort out differential
diagnoses indicated by clinical history and examination. Currently, the investigations have a smaller role in psychiatric diagnosis as compared to other specialties.¹ In psychiatric practice, mostly, investigations are needed to exclude a medical condition or an organic etiology suspected to have caused behavioral symptoms simulating a functional psychiatric disorder. Investigations are also carried out as “routine investigations” to assess comorbid general medical conditions and to obtain baseline functions of certain organs or body systems to monitor the side effects of the prescribed psychotropic medicines. Psychotropic drug levels and urine toxicology are the other investigations ordered in psychiatric practice. It is worth mentioning that despite advances in our knowledge about chemical, physiological, and structural brain changes in psychiatric disorders, none of the psychiatric disorders is diagnosable by any of the investigations that we have till date.³

Except for some broad indications, there are no specific guidelines on carrying out various investigations in patients with mental illnesses. There is a lack of consensus regarding optimal patient workup and optimal battery of laboratory and other tests.²,³ It is widely perceived by patients, general public, and even by some medical professionals that many times more investigations are done than what is deemed necessary by the clinical rationale. There are many studies in psychiatry⁴⁻¹⁰ as well as other clinical specialties¹¹⁻¹⁴ on this issue from Western countries. These studies have assessed the extent to which investigations are done in clinical practice and have looked into various clinical, administrative, and economic aspects of carrying out investigations. To the best of our knowledge, there has not been any published study from India on the frequency of commonly ordered investigations in patients with mental illnesses. We carried out a cross-sectional study in three different clinical settings in North Rajasthan to find out that how frequently patients with mental illnesses are subjected to various brain-related and other investigations. We also looked into socio-demographic and clinical correlates of these investigations carried out on the patients. The idea behind the study was to obtain some preliminary information on the topic which has multiple implications, namely treatment cost and inconvenience to individual patients, cost to health system, public perception about mental health care, and place of psychiatry as a medical specialty. The information obtained in the study could be useful in guiding further in-depth investigation into this topic.

**Objectives**

- To study the frequency and pattern of electroencephalography (EEG), computerized tomography (CT) head, magnetic resolution imaging (MRI) brain, and blood investigations carried out by the previous doctors on patients seeking treatment at a community mental health clinic, a district level psychiatric hospital, and psychiatry outpatient clinic of a medical college
- To study the socio-demographic and clinical correlates of investigations carried out on these patients.

**MATERIALS AND METHODS**

**Study design**

This is a cross-sectional study of investigations carried out on patients by their previous doctors before their help-seeking at three different mental health-care settings.

**Study settings**

Patients were recruited from three different outpatient settings in North Rajasthan, namely service delivery outreach camp of a community mental health program at block level, a private psychiatric hospital at district level, and psychiatry outpatient clinic of a Government Medical College. These settings represented a mix of primary, secondary, and tertiary health-care settings in private, government, and nongovernmental organization sectors catering mostly to the patients from North Rajasthan and adjoining parts of Punjab and Haryana.

**Study sample**

A period sample of 3 months (June 2012–August 2012) planned to obtain a minimum sample size of 50 at each site which was considered adequate to conduct preliminary research on this hitherto unstudied issue. All the patients seeking treatment for the first time at three consecutive monthly mental health camps were included in the sample from community camp setting. At the other two settings, patients attending psychiatry outpatient department as new cases during the week following the date of community camp were recruited by systematic random method.

**Study measures and tools**

A semi-structured interview pro forma was designed to obtain information on study measures. The study measures included socio-demographic variables, clinical variables, and variables related to investigations carried out in the patients by their previous doctors prior to the current consultation. Three specific investigations commonly used to study brain function and structure were included - EEG, CT head, and MRI brain. Specific questions were asked about each of these investigations: (a) Whether the investigation had been carried out any time during their illness and (b) who had asked for the investigation. Patients were also asked if any other investigations were carried out and similar details were obtained for those investigations. Patients were diagnosed through a routine clinical examination by one of the senior psychiatrists using International Classification of Diseases-10 diagnostic guidelines. Comorbid or independent neurological disorders were also recorded.
Data collection
The information was obtained through face-to-face interview of the patients and family members in their mother tongue. The interviews were conducted by postgraduate trainees who were trained by a senior psychiatrist. Locally used descriptive terms (e.g., mind’s ECG for EEG and colored X-ray for CT head) were used whenever needed. The respondents were encouraged to recall the correct information, but were refrained from guessing it. Whenever respondents were uncertain about a particular investigation, the investigation was considered as “not done.” Whenever possible, the information was further verified from the previous treatment records available with patients. No attempt was made to evaluate the appropriateness of investigations in individual cases as the validity of such evaluation would be limited due to lack of adequate information about clinical circumstances in which the investigations were ordered.

Ethical considerations
The study was approved by the Ethics Review Committee of medical college involved in the study. Only those patients/family members who gave written informed consent to participate in the study were included in the study.

Data analysis
Predictive analysis software (PASW) statistics-18 by SPSS Inc. Chicago, USA was used for statistical analysis. Descriptive statistics was calculated. Proportions were compared using Chi-square test.

### RESULTS

A total of 160 patients were included in the study. The socio-demographic profile of the patients is shown in Table 1. There were more male patients in the community camp and district-level hospital group as compared to medical college where males and females were equal in number. At district hospital, most of the patients came from rural areas while at community camp and medical college, many patients came from urban areas.

#### Clinical characteristics of patients

Table 2 provides clinical profile of the patients in the study. The patients seeking help at community camp had longer duration of illness. Patients presenting at medical college and district hospital were more likely to have a diagnosis of schizophrenia and other psychotic illness, bipolar affective disorder, and dissociative disorder as compared to those presenting at the community camp. Patients presenting at the community camp were more likely to have a diagnosis of depressive disorders and seizure disorders as compared to other settings.

#### Investigations done in patients

Table 3 indicates various investigations done in the patients by their previous doctors prior to their help-seeking at three different settings. About half (47.5%) of the patients had got at least one of the three (EEG, CT-scan head, and MRI scan of brain) investigations done at some point of time during their illness. More than one-third (37.5%) had EEG, one in

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### Table 1: Sociodemographic profile of the study sample (n=160)

| variables                  | Community camp* (n=55) | Psychiatry OPD in medical college* (n=55) | District-level hospital* (n=50) | Total* (n=160) | χ²/F (P)   |
|----------------------------|------------------------|------------------------------------------|-------------------------------|----------------|------------|
| Age (years): Mean±SD       |                        |                                          |                               |                |            |
| Gender                     |                        |                                          |                               |                |            |
| Male                       | 43 (78.2)              | 27 (49.1)                                | 30 (60)                       | 100 (62.5)     | 10.124 (0.0063) |
| Female                     | 12 (21.8)              | 28 (50.9)                                | 20 (40)                       | 60 (37.5)      |            |
| Education                  |                        |                                          |                               |                |            |
| Illiterate                 | 9 (16.4)               | 19 (34.5)                                | 9 (18)                        | 23 (21)        | 10.624 (0.1007) |
| Up to middle               | 20 (36.3)              | 15 (27.3)                                | 23 (46)                       | 58 (36.3)      |            |
| Up to higher secondary     | 16 (29.1)              | 14 (25.5)                                | 15 (30)                       | 45 (28.1)      |            |
| Graduation and above       | 10 (18.2)              | 7 (12.7)                                 | 3 (6)                         | 20 (12.5)      |            |
| Marital status             |                        |                                          |                               |                |            |
| Married                    | 40 (72.7)              | 48 (87.3)                                | 37 (74)                       | 125 (78.1)     | 4.129 (0.1268) |
| Unmarried                  | 15 (27.3)              | 7 (12.7)                                 | 13 (26)                       | 35 (21.9)      |            |
| Type of family             |                        |                                          |                               |                |            |
| Joint                      | 30 (54.5)              | 34 (61.8)                                | 29 (58)                       | 93 (58.12)     | 6.791 (0.1473) |
| Nuclear                    | 16 (29.1)              | 12 (21.8)                                | 19 (38)                       | 47 (29.38)     |            |
| Extended nuclear           | 9 (16.4)               | 9 (16.4)                                 | 2 (4)                         | 20 (12.5)      |            |
| Religion                   |                        |                                          |                               |                |            |
| Hindu                      | 42 (76.4)              | 50 (90.9)                                | 33 (66)                       | 125 (78.1)     | 9.661 (0.00798) |
| Non-Hindu                  | 13 (23.64)             | 5 (9.1)                                  | 17 (34)                       | 35 (21.88)     |            |
| Domicile                   |                        |                                          |                               |                |            |
| Rural                      | 27 (49.1)              | 24 (43.6)                                | 43 (86)                       | 94 (58.8)      | 22.622 (0.000) |
| Urban                      | 28 (50.91)             | 31 (56.36)                               | 7 (14)                        | 66 (41.25)     |            |

*Figures in the parentheses indicate percentage. SD – Standard deviation; OPD – Outpatient department
Table 2: Clinical profile of the study sample (n=160)

| Variables | Community camp* (n=55) | Psychiatry OPD in medical college* (n=55) | District-level hospital* (n=50) | Total* (n=160) | χ²/F (P) |
|-----------|------------------------|------------------------------------------|--------------------------------|----------------|----------|
| Duration of illness (months): Mean±SD | 96.52 (93.14) | 52.38 (65.64) | 28.34 (35.74) | 60.24 (74.98) | 12.86 (0.000) |
| Course of illness (years) | | | | | |
| Continuous <2 | 19 (34.5) | 25 (45.5) | 22 (44.0) | 66 (41.3) | 6.272 (0.179) |
| Continuous ≥2 | 25 (45.5) | 18 (32.7) | 12 (24.0) | 55 (34.4) | | |
| Episodic | 11 (20.0) | 12 (21.8) | 16 (32.0) | 39 (24.4) | | |
| Onset of illness | | | | | |
| Sudden | 36 (65.5) | 32 (58.2) | 30 (60) | 98 (61.3) | 0.661 (0.718) |
| Gradual | 19 (35.5) | 23 (41.8) | 20 (40) | 62 (38.7) | | |
| Diagnosis | | | | | |
| Schizophrenia and other psychosis | 5 (9.1) | 13 (23.6) | 19 (38.0) | 37 (23.1) | FE P<0.001 |
| Depressive disorder | 17 (30.9) | 8 (14.5) | 12 (24) | 37 (23.1) | | |
| BPAD | 6 (10.9) | 10 (18.2) | 11 (22) | 27 (16.9) | | |
| Anxiety disorder and somatoform disorder | 6 (10.9) | 10 (18.2) | 3 (6.0) | 19 (11.88) | | |
| Dissociative conversion disorder | 2 (3.6) | 6 (10.9) | 5 (10) | 13 (8.1) | | |
| Headache | 4 (7.3) | 0 (0.0) | 0 (0.0) | 4 (2.5) | | |
| Substance use disorder (other than nicotine) | 3 (5.5) | 4 (7.3) | 0 (0.0) | 7 (4.4) | | |
| Seizure disorder | 7 (12.7) | 2 (3.6) | 0 (0.0) | 9 (5.6) | | |
| Other† | 5 (9.1) | 2 (3.6) | 0 (0.0) | 7 (4.4) | | |

*Figures in the parentheses indicate percentage; †Includes mental retardation (1); Parkinsonism (1); anger-control problem (1); posthead injury/stroke sequelae (3); no psychiatric diagnosis (1). SD – Standard deviation; OPD – Outpatient department; BPAD – Bipolar affective disorder; FE – Fisher’s exact

Table 3: Investigations done in the study sample: An overview (n=160)

| Investigation done | Community camp* (n=55) | Psychiatry OPD in medical college* (n=55) | District-level hospital* (n=50) | Total* (n=160) | χ² (P) |
|--------------------|------------------------|------------------------------------------|--------------------------------|----------------|-------|
| EEG (total) | 22 (40.0) | 10 (18.2) | 28 (56.0) | 60 (37.5) | 16.206 (0.000) |
| CT head | 15 (27.3) | 14 (25.5) | 3 (6.0) | 32 (20.0) | 8.966 (0.0113) |
| MRI brain | 8 (14.5) | 4 (7.3) | 2 (4.0) | 14 (8.8) | FE (0.1541) |
| At least one of three | 29 (52.7) | 20 (36.4) | 27 (54.0) | 76 (47.5) | 4.185 (0.1234) |
| Others | | | | | |
| X-ray skull | 1 (1.8) | 0 (0) | 0 (0) | 1 (0.6) | FE (0.6019) |
| ECG | 0 (0) | 1 (1.8) | 1 (2) | 2 (1.2) | | |
| USG, endoscopy | 0 (0) | 4 (7.2) | 2 (4.0) | 6 (3.8) | | |
| Thyroid function test | 0 (0) | 1 (1.8) | 0 (0) | 1 (0.6) | | |
| Hemogram | 2 (3.6) | 0 (0) | 0 (0) | 2 (1.2) | | |
| Others (total) | 3 (5.4) | 6 (10.8) | 3 (6) | 12 (7.5) | | |

*Figures in the parentheses indicate percentage. OPD – Outpatient department; EEG – Electroencephalogram; CT – Computerized tomography; MRI – Magnetic Resonance Imaging; ECG – Electrocardiogram; USG – Ultrasonography; FE – Fisher’s exact

It is clear from Table 5 that about half of the patients with bipolar disorder (48.1%), more than one-third of patients with schizophrenia (35.1%) and depression (37.8%), and nearly two-third of the patients of dissociative disorder (61.5%) had an EEG done. Nearly, half of the patients with bipolar disorder (44.4%) and about one-fourth of the patients with dissociative disorder (23%) and depressive disorder (21.6%) had a CT-head done.

Relationship between having seen a psychiatrist and having an investigation done

Nearly, half of the patients (47.7%) who had been seen by a psychiatrist had an EEG, and more than one-fourth (27.1) of the patients seen by a psychiatrist had undergone a CT-scan head [Table 4]. Mostly, it was a psychiatrist who had advised EEG (84.7%), CT-head (68.9%), and MRI brain (53.8%) to the patients in this study.

Investigations done in various disorders

It is clear from Table 5 that about half of the patients with bipolar disorder (48.1%), more than one-third of patients with schizophrenia (35.1%) and depression (37.8%), and nearly two-third of the patients of dissociative disorder (61.5%) had an EEG done. Nearly, half of the patients with bipolar disorder (44.4%) and about one-fourth of the patients with dissociative disorder (23%) and depressive disorder (21.6%) had a CT-head done.

Relationship between investigations and socio-demographic characteristics

There was no association between socio-demographic characteristics and investigations.

DISCUSSION

A rational and systematic approach in selecting appropriate investigations helps a psychiatrist to make an accurate diagnosis, to start appropriate treatment, and to render cost-effective care. On the contrary, inappropriate or indiscriminate use of investigations is likely to result in a
compromise in efficacy or cost-effectiveness of clinical care. Inadequate use of investigations may lead to missing of a significant physical illness or lack of proper monitoring of drug side effects.[6] On the other hand, overuse of available laboratory facilities and doing unnecessary investigations can result in increased burden on health services, increased financial burden on patients, unnecessary inconvenience and discomfort to the patients and their carers, and can put patients on iatrogenic risks.[3,6,8,15] Many studies have demonstrated limited utility of widespread indiscriminate investigations in psychiatric patients either due to low test yield or due to lack of appropriate follow-up action.[4,6,9,15] Many authors have highlighted futility or very minimal utility of costly investigations such as MRI and CT brain.[10,16] Kala[17] suggested limited utility of certain investigations such as therapeutic drug monitoring in developing countries, in view of cost-effectiveness, ethno-pharmacological, and sociocultural issues.

| Table 4: Relationship between having seen a psychiatrist and having an investigation* |
|-------------------------------------------------------------|
| Investigation done | Seen a psychiatrist† | Total number of investigation done* | \( \chi^2 (P) \) |
|-------------------|---------------------|-----------------------------|----------------|
| EEG done | Yes | 51 (47.7) | 9 (17.0) | 60 (37.5) | 14.237 | 0.000 |
| No | 56 (52.3) | 44 (83.0) | 0.858 |
| CT head done | Yes | 29 (27.1) | 3 (5.7) | 32 (20.0) | 10.185 | 0.001 |
| No | 78 (72.9) | 50 (94.3) | |
| MRI brain done | Yes | 9 (8.6) | 5 (9.4) | 14 (8.9) | 0.032 | 0.858 |
| No | 96 (91.4) | 48 (90.6) | |
| Other investigations | Yes | 6 (5.6) | 6 (11.3) | 12 (7.5) | 1.668 | 0.196 |
| No | 101 (94.4) | 47 (88.7) | 1.668 |

*Analysis of patients in which different investigations were done; hence, number of patients varies according to the investigation; †Figures in the parentheses indicate percentage; EEG – Electroencephalogram; CT – Computerized tomography; MRI – Magnetic resonance imaging

Brain imaging, electroencephalogram, and various hematological, biochemical, endocrinological, and toxicological investigations are commonly carried out in psychiatric practice. There are no prescribed guidelines regarding the use of these investigations, and it is largely left to the clinical judgment of psychiatrists[2,6] Research studies looking for deranged biological parameters in patients with psychiatric disorders have either shown mixed findings or shown findings without diagnostic value.[10] As a general principle, investigations should help in subsequent management decisions. If the management plan formulated based on clinical history and mental status examination is unlikely to be altered or affected by the possible results of the investigation, the investigation should be considered irrelevant to the patient’s management at that time.[2,16]

Extent of investigations carried out on patients in the present study

The present study, the first of its kind in India, looked into three major brain investigations, namely EEG, CT head, and MRI brain, besides many other investigations in patients with psychiatric disorders. As there are no other data to compare with and there were no attempt to validate the appropriateness of investigations in the study subjects, the following discussion on the study findings is based on the overall clinical experience of the senior psychiatrists and the clinical curiosity of the postgraduate trainees involved in the study.

Electroencephalography

Notwithstanding the lack of attempt at validation of appropriateness of the investigations in the study subjects, 37.5% of them undergoing EEG may indicate over-investigation. Our impression gets further substantiated by the diagnostic profile of these patients. One may have doubts about the clinical appropriateness of EEG in every alternate patient with bipolar affective disorder, and every third patient with schizophrenia and other psychotic disorders, or depressive disorders without any comorbid neurological problems. Some of the

| Table 5: Investigations done in various disorders (n=160)* |
|-------------------------------------------------------------|
| Disorder | Number of patients | Number of patients with investigation |
|---------|-------------------|--------------------------------------|
| EEG | CT-head | MRI-brain | Others |
| Schizophrenia and other psychosis | 37 | 13 (35.1) | 03 (8.1) | 01 (2.7) | 01 (2.7) |
| Depressive disorder | 37 | 14 (37.8) | 08 (21.6) | 01 (2.7) | 02 (5.4) |
| BPAD | 27 | 13 (48.1) | 12 (44.4) | 01 (3.7) | 00 (0.0) |
| Anxiety disorder and somatoform disorder | 19 | 02 (10.52) | 00 (0.0) | 01 (5.26) | 07 (36.84) |
| Dissociative conversion disorder | 13 | 08 (61.5) | 03 (23.0) | 01 (7.7) | 01 (7.7) |
| Headache | 4 | 01 (25) | 00 (00) | 00 (00) | 01 (25) |
| Substance use disorder (other than nicotine) | 7 | 01 (14.3) | 00 (00) | 00 (00) | 00 (00) |
| Seizure disorder | 9 | 06 (66.6) | 04 (44.4) | 06 (66.6) | 00 (00) |
| Others† | 7 | 02 (28.5) | 02 (28.5) | 03 (42.8) | 00 (00) |
| Total | 160 | 60 | 32 | 14 | 12 |

*Figures in the parentheses indicate percentage; †Includes mental retardation (1); Parkinsonism (1); anger-control problem (1); posthead injury/stroke sequelae (3); no psychiatric diagnosis (1). EEG – Electroencephalogram; CT – Computerized tomography; MRI – Magnetic resonance imaging; BPAD – Bipolar affective disorder
patients with these disorders might have had presented in a confusional state or might have a differential diagnosis at the time of onset or during initial course of their illness warranting an EEG. However, this may not be the case with one-third to half of these patients.

Computerized tomography head
Overall, CT head in nearly half of the patients with bipolar affective disorder and one-fourth of patients with depressive disorder may be pointing toward excessive investigation, though retrospective validation is difficult in this study design. Patients visiting community camp or medical college had a CT head more frequently, perhaps due to more complicated cases in medical college and more patients with seizure disorders at community clinic.

Magnetic resolution imaging brain
MRI brain in six patients with seizure disorder and three patients with posthead injury or poststroke sequelae seem to have been indicated clinically. It is difficult to comment on MRI brain in remaining five patients with a functional psychiatric illness and their clinicians might have had some justifiable reason to consider MRI for them.

Other investigations
Only 12 patients (7.5%) had some other investigations done as listed in Table 3. Patients did not report having investigations such as fasting blood sugar, lipid profile, renal function tests, or kidney function tests. It is possible that the respondents may have poor recollection of routine blood investigations as compared to investigations such as EEG and brain scans. Notwithstanding this limitation of information collection, we felt that routine blood tests such as hemogram, liver function test, kidney function test, and thyroid function test were probably done less frequently than would have been warranted clinically. None of the patients reported being told by their doctor about any test to monitor the side effects of prescribed medicines.

Possible factors contributing to excessive and inappropriate investigations
Various factors that may contribute to excessive investigations in patients with mental illnesses are (i) emerging trend of perceiving investigations as gold standard in confirmation of diagnosis in medical practice, (ii) attempts to emphasize psychiatry as a medical specialty and to establish the credibility of psychiatric diagnosis by brain investigations, (iii) tendency to rely excessively on investigations to compensate inadequacies in clinical assessment, (iv) aggressive marketing by imaging centers and laboratories with clear commercial interests, (v) defensive medical practice in view of increasing litigations against doctors under Consumer Protection Act (1986), and (vi) effect of patients’ expectations. Here, it is worthwhile to discuss the possible role of patients’ satisfaction and clinicians’ perception of patients’ expectations in ordering of investigations by clinicians. Many of the patients may expect doctors to diagnose their illnesses “more accurately” with the help of investigations. Psychiatrists’ perception about patients’ expectations may be a driving force behind many of the investigations that otherwise would be deemed unnecessary on clinical grounds. Little et al. observed that doctors’ perception about patient pressure was the strongest predictor of ordering unnecessary investigations. Similarly, other researchers have found influences of patients’ pressures and expectations on doctors’ prescribing practices. However, there is a strong possibility that these perceptions are exaggerated and might be true only about a particular subset of patients or family members. In some patients, certain investigations (e.g. neuro-imaging in patients with chronic headache) can be useful to re-assure patients and prevent further window shopping in these patients. The results about this re-assuring effect of investigations are inconsistent, and one has to be careful in selecting the patients to utilize this effect of investigations.

Possible factors contributing to suboptimal investigations
The study findings suggestive of suboptimal blood tests may be attributed partially to recollection bias and partially to the difficulty in convincing a patient or his family about the need to test for liver, kidney, or other body organs’ functions in a patient with mental disorder. Many of the psychiatrists may prefer to rely on clinical monitoring of side effects rather than laboratory monitoring.

Limitations of the study
• The information about investigations carried out prior to present consultation was based on recollection by the patients and their family members, supplemented with the investigation reports and scan films, whenever possible. While recollection about major investigations such as EEG, CT head, and MRI brain is likely to be more complete and correct, the recollection of blood investigations is likely to be incomplete. Thus, a possibility of underestimation of blood investigations cannot be ruled out.
• Since the doctors who had ordered investigations were not contacted, the details of circumstances that led to a clinical decision of ordering investigations were not known. Therefore, no evaluation for appropriateness of the investigations in individual study subjects could be done. The possible factors in discussion sections are described based on authors’ experience and informal interaction with other psychiatrists and medical colleagues. Many of the opinions expressed in this paper, therefore, are only suggestive in nature and need further evaluation in future studies.
The sample size was small to carry out a multivariate analysis or to generalize the study findings to a larger universe. However, it was adequate to get some preliminary information on an uninvestigated issue.

Another limitation of the study was the presence of neurological disorders in some of the patients.

CONCLUSION

This study reports the frequency and pattern of investigations that psychiatric patients had undergone before presenting at a community camp, a district-level psychiatric hospital, and psychiatric outpatient clinic of a medical college. The study suggested that some of the investigations such as EEG and CT head were probably carried out excessively; perhaps more than what would have been clinically indicated. On the other hand, some of the investigations mainly blood investigations were possibly carried out suboptimally. Excessive and unnecessary investigations cause extrafinancial burden, inconvenience and discomfort to the patients, and adverse impact on peoples’ beliefs about mental illnesses, and difficulties for the public mental health programs. Suboptimal investigations may result in missing out significant comorbid medical illnesses and drug side effects. However, the study findings are only suggestive in nature as no validation of appropriateness of investigations in the study subjects could be done. There is a need to carry out further studies on larger samples with prospective design to look into the appropriateness of investigations carried out in patients with psychiatric disorders and the factors contributing to excessive or suboptimal investigations. Qualitative research with psychiatrists to know their views can also be conducted to supplement the quantitative studies.

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Conflicts of interest
There are no conflicts of interest.

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