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RESEARCH ARTICLE

PREVALENCE AND PREDICTORS OF POTENTIALLY INAPPROPRIATE MEDICATIONS (PIMS) IN SAUDI OLDER ADULTS WITH MOOD AND ANXIETY DISORDERS: A SYSTEMATIC REVIEW

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Abstract

Background: Potentially inappropriate medications(PIMs)are common in older adults and are associate with adverse drug events, hospitalizati on, and increased health-care costs. Older adults with mood and anxiety disorders may be at heightened risk due to psychotropic exposure, multimorbidity, and polypharmacy.

Objective: To synthesize Saudi evidence on (i) the prevalence of PIM exposure among adults aged ≥60 years and (ii) consistent predictors of PIM exposure, with particular attention to psychiatric populations and mood/anxiety-related subgroups when reported.

Methods: We conducted a PRISMA 2020-compliant systematic review of peer-reviewed observational studies conducted in Saudi Arabia. PubMed/MEDLINE, Embase, PsycINFO, Web of Science, and the Saudi Digital Library were searched from inception through March 2025.Studies reporting extractable prevalence of ≥1 PIM and/or adjusted predictors using explicit criteria(e.g., AGS Beers; STOPP/ST ART) were eligible. Risk of bias was assessed using the Joanna Briggs Institute (JBI) checklist for prevalence studies and the NIH quality assessment tools for observational studies. Due to substantial heterogen eity across settings and criteria versions, findings were synthesized narratively; where appropriate, descriptive sample-size weighted preval ence summaries were reported.

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Results: Eleven observational studies (total N=42,353; predominantly adults aged ≥65 years) were included across primary care, outpatient specialty care, home health care, psychiatric services, and hospital settings. Prevalence of ≥1 PIM ranged from 40.6% in primary care cohorts to 82.4% in hospitalized and longitudinal dispensing cohorts; most large outpatient studies clustered around approximately 57%–64%. Polypharmacy (commonly ≥5 medications) was the most consistent predictor (adjusted OR range approximately 4–24), followed by multimorbidity, increasing age, frailty, and psychiatric complexity; female sex was associated with higher PIM exposure in several ambulatory cohorts. Common PIM classes included proton pump inhibitors, benzodiazepines, antipsychotics, NSAIDs, and anticholinergics.
Conclusion: PIM exposure is common among older adults in Saudi Arabia and appears particularly elevated in high-intensity care settings and psychiatrically complex populations. Polypharmacy and multimorbidity are consistent drivers. These findings support prioritizing structured medication review and deprescribing pathways, supported by electronic decision support and multidisciplinary geriatric care, while acknowledging heterogeneity across studies and criteria versions.

Introduction:-

Potentially inappropriate medications (PIMs) are medications in which the risk of harm outweighs potential benefit in older adults, particularly when safer alternatives exist. PIM exposure is associated with adverse drug events, hospitalization, functional decline, and increased health-care costs [1]. Older adults with psychiatric conditions, including mood and anxiety disorders, may face additional risk due to higher rates of psychotropic use, multimorbidity, and age-related pharmacokinetic and pharmacodynamic changes.International estimates of PIM prevalence vary greatly, ranging between approximately 25 per cent and more than 90 per cent depending on the criteria adopted and the care setting [2]. In Saudi Arabia, large outpatient data show between 57.2% and 63.6% of people aged >=65 years were prescribed at least one PIM based on the 2019 AGS Beers criteria, with a clear upward trend over the period from 2017 to 2019 [3]. Polypharmacy (5 or more medications) was associated with an almost 24-fold higher adjusted risk of PIM use (adjusted OR = 23.91), and having five or more diagnoses was associated with a 3-fold higher odds of PIM use (adjusted OR = 3.20) [3].

Smaller cross-sectional studies support high PIM prevalence. In a family medicine setting, 60.7 % of older patients had PIMs with increasing age (OR per 5 years = 1.47), female sex (OR = 1.95), and polypharmacy (OR = 8.21) were significant predictors [4]. In psychiatric outpatient populations, 50.98 percent of older adults with psychiatric diagnoses had PIMs, and there was a strong correlation between the number of prescriptions and the number of PIMs ($r = 0.76$, $p < .0001$) and increased risk for those with comorbid neurological diseases (adjusted OR = 2.48) [2]. Psychotropic polypharmacy was 77.7 %, which shows the complexity in managing mood and anxiety disorders in this age group [5][6].Despite these data, there are very few studies isolating mood and anxiety subgroups to examine PIM prevalence and predictors. This systematic review goes through the available evidence to elucidate the prevalence estimates, the associated demographic and clinical predictors, and implications for the deprescribing practice in geriatric psychiatric populations in Saudi Arabia.

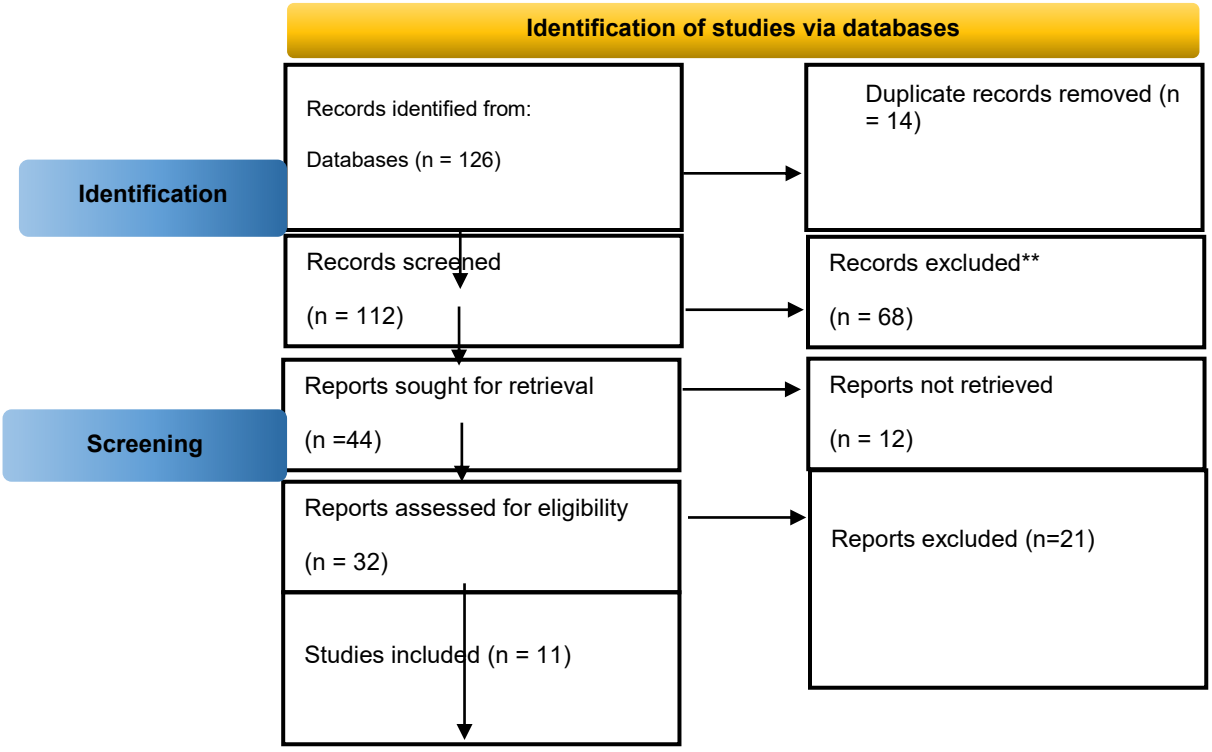
Methods:-

Procedure and reporting system:-

The review was conducted in accordance with PRISMA 2020. A prespecified protocol guided eligibility criteria, outcomes, and synthesis decisions. The study selection process is summarized in the PRISMA flow diagram (Figure 1).

The protocol established the target, eligibility criteria, primary and secondary outcomes, the analysis plan of pooling prevalence, and the risk-of-bias plan. The protocol was registered in PROSPERO (CRD420261307581).

Figure 1: Prisma Flow Diagram



Eligibility criteria (PICOS):-
Population: Saudi adults (aged 60 years and older, majority 65 years and older) with mood disorders or anxiety disorders, dementia, or closely related psychiatric comorbidity. Intervention/Exposure: prescription/dispensing of at least one PIM as identified through explicit screening instrument(s) (e.g. AGS Beers criteria; STOPP/START). Comparator: where it is possible, a cluster of medicines or comorbidities. Outputs: (1) prevalence of 1 or more PIM and, where this is not available, prevalence of multiple PIMs; (2) adjusted predictors of PIM exposure (e.g., polypharmacy, multimorbidity, frailty, demographic factors); and (3) most commonly reported PIM classes of medication. Design: observational designs (peer-reviewed cross-sectional, retrospective cohorts, or longitudinal dispensing cohorts) have been done in Saudi Arabia. The criteria that were used to exclude were case reports, editorials, interventional trials lacking baseline prevalence data, and non-Saudi populations.

Sources and search strategy of information:-
The databases that were searched include PubMed/MEDLINE, Embase, PsycINFO, Web of Science, and Saudi Digital Library from inception until March 2025. Reference lists of potential articles and pertinent reviews on Saudi Arabia were also screened. The search involved the controlled vocabularies and free-text words of the concepts Saudi Arabia, older adults/geriatrics, potentially inappropriate medications, Beers criteria, STOPP/START, depression, anxiety, and psychiatric disorders. An example PubMed strategy that could be replicated was: (Saudi OR "Saudi Arabia" OR "Kingdom of Saudi Arabia") AND (older OR elderly OR geriatric* OR aged OR "older adult*" OR "aged 60" OR "aged 65") AND ("potentially inappropriate" OR PIM OR "inappropriate prescribing" OR Beers OR STOPP OR START) AND (depress* OR anxiety OR "mood disorder*" OR psychiatric OR psychogeriatric OR dementia)

Study selection:-
Titles and abstracts were independently screened by two reviewers against the predefined PICOS criteria. Full texts were retrieved when eligibility was unclear. Disagreements were resolved by consensus and, when required, a third reviewer. Records that contained potentially useful information or eligibility that was not clear were obtained in full. Controversies were solved through debate, and where necessary,by seeking the opinion of a third reviewer. Cells in the PRISMA flow diagram were labeled with reasons to have transparent reporting.

Extraction of data and data items:-
We included: study design; setting and region; sampling frame; sample size; mean age and sex distribution; psychiatric diagnosis definitions; PIM criteria and version; PIM prevalence (1 where available) and PIM prevalence (2 where available); and list of common PIM classes and adjusted effect estimates of the predictors (odds ratios with 95% confidence intervals). In case several multivariable models were found, the fully adjusted model was obtained. In the case of longitudinal studies, we obtained overall prevalence and trajectory group measures where available.

Risk of bias assessment:-
Risk of bias was assessed using the Joanna Briggs Institute (JBI) critical appraisal checklist for prevalence studies and the NIH Quality Assessment Tools for observational cohort/cross-sectional studies. Two reviewers appraised each study; disagreements were resolved by consensus. Study-level judgments were summarized as low, moderate, or high risk of bias and incorporated into interpretation. The study-level risk of bias judgments for all included studies are summarized in Table 1.

Synthesis and statistical analysis:-
Due to substantial clinical and methodological heterogeneity across settings, populations, and criteria versions (Beers 2015/2019/2023; psychotropic-only vs overall PIMs), formal meta-analysis was not considered appropriate for the primary synthesis. We therefore summarized prevalence estimates as ranges across settings and reported descriptive sample-size–weighted prevalence summaries where sufficient point estimates were available. Predictors were synthesized narratively with emphasis on consistency of direction and magnitude of adjusted associations. In areas where pooling was inappropriate, synthesis of prevalence estimates and effects of predictors was performed in a narrative fashion, with focus being placed on consistency in direction and effect sizes among studies.

Table 1. Risk of Bias Assessment of Included Studies

Study (Year)	Sampling frame	PIM ascertain.	Outcome definition	Confounders	Stats reporting	Overall RoB
Jabri et al. (2025)	National dispensing database, population-based	Beers' criteria applied algorithmically	Clear definition of ≥1 PIM and trajectories	Adjusted for age, sex, diagnoses, and polypharmacy	Multivariable models, trajectory analysis	Low – Moderate
Jabri et al. (2023)	Large outpatient cohort, multi-year	Beers 2019	Standardized ≥1 PIM	Adjusted for demographics, diagnoses, and medication count	Fully reported ORs and CIs	Low – Moderate
Alhawassi et al. (2019)	Single tertiary ambulatory center	Beers 2015	Standardized	Adjusted for age, sex, comorbidity, and polypharmacy	Multivariate regression	Moderate

Study (Year)	Sampling frame	PIM ascertain.	Outcome definition	Confounders	Stats reporting	Overall RoB
Alwhaibi et al. (2022)	Chronic disease outpatient clinics	Beers 2019	Clear	Partial adjustment	Regression reported	Moderate
Prabahar et al. (2024)	Multicenter hospitalized cohort	Beers 2023	Clear	Limited adjustment	Descriptive + regression	Moderate
Meraya et al. (2021)	Psychiatric outpatient clinics	Psychotropic Beers only	Incomplete (non-psychotropics excluded)	Limited	Prevalence + correlation	High
Khawagi et al. (2024)	Home health care registry	Beers	Clear	Partial	Logistic regression	Moderate
Frailty inpatient study	Tertiary hospital	Beers 2019	Clear	Limited	Descriptive + adjusted	Moderate – High
Dementia stratified study	Outpatient clinics	Beers	Clear	Partial	Group comparisons	Moderate

Study (Year)	Sampling frame	PIM ascertain.	Outcome definition	Confounders	Stats reporting	Overall RoB
Family medicine clinics	Single primary care center	Beers	Clear	Limited	Regression	Moderate – High
Alahsa primary care	Single regional clinic	Beers 2023	Clear	None	Descriptive	High

Interpretation of risk of bias and evaluation:-

The most prevalent limitations associated with representativeness and measurement situations were observed across the included studies. A large number of studies sampled tertiary hospitals, specialist clinics, or regional programmes, which probably over-represent patients with advanced multimorbidity and high medication burden. This has the potential to overestimate prevalence in comparison with those living in the community and who have primary care that is limited to routine care. The second limitation common in both cases was that they were based on administrative prescribing or dispensing records with no clinical review of the indication, length, or dose. Although it is a suitable method to monitor a population, it may wrongly label some clinically justifiable prescribing as PIMs (e.g.,short-term use, palliative situations, or exceptional use by a specialist). The control of confounding was not controlled: age, sex, comorbidity, and number of medications were often controlled, though frailty, functional status, severity of cognitive impairment, renal function, and over-the-counter medicine use were not commonly assessed. In general, internal validity in large national dispensing/outpatient cohorts was better as a result of sampling and multivariable modelling (population level), compared to those that sampled psychotropic PIMs or single-centre clinic samples (prone to measurement bias and residual confounding). These trends were taken into consideration in the interpretation of both the pooled prevalence and the strength of associations between the predictors.

Results:-

This systematic review included eleven observational studies conducted in Saudi Arabia, comprising a total of 42,353 older adults, predominantly aged ≥65 years. Most studies were cross-sectional, with one large longitudinal trajectory analysis and several retrospective inpatient and outpatient cohort studies. Care settings included national dispensing databases, tertiary hospitals, primary care clinics, family medicine practices, psychiatric outpatient services, and home health care programs. All studies applied explicit prescribing criteria, most commonly versions of the American Geriatrics Society (AGS) Beers Criteria (2015–2023). Detailed characteristics of the included studies, including design, setting, sample size, population focus, and PIM criteria version, are summarized in Table 2.

Table 2: Characteristics of Included Studies on Potentially Inappropriate Medications (PIMs)

Jabri et al. (2025) [9]	Longitudinal cohort	National dispensing database	Older adults ≥65	9,887	NR	Beers (explicit)	General older adults
Jabri et al. (2023) [3]	Cross-sectional	Outpatient	Older adults ≥65	23,417	NR	Beers	General older adults
Alhawassi et al. (2019) [1]	Cross-sectional	Ambulatory tertiary care	Older adults ≥65	4,073	72.6 ± 6.2	Beers 2015	General older adults

Alwhaibi et al. (2022) [8]	Cross-sectional	Ambulatory care	Older adults ≥65 with DM + HTN	1,853	NR	Beers	Chronic disease
Prabahar et al. (2024) [19]	Retrospective	Hospital inpatient	Older adults ≥65	420	75.5 ± 8.7	Beers 2023	Hospitalized
Meraya et al. (2021) [5]	Cross-sectional	Psychiatric outpatient	Older adults ≥65	~1,300	NR	Beers (psychotropic)	Psychiatric disorders
Khawagi et al. (2024) [23]	Cross-sectional	Home health care	Older adults ≥65	375	NR	Beers	Community/home care
Frailty study [13]	Cross-sectional	Tertiary inpatient	Older adults ≥65	358	NR	Beers 2019	Frail older adults
Dementia stratified study [14]	Retrospective	Outpatient	Older adults ≥65	270	NR	Beers	Dementia vs non-dementia
Family medicine clinics [6]	Cross-sectional	Primary care	Older adults ≥65	270	72.4 ± 6.2	Beers	Primary care
Alahsa primary care [10]	Cross-sectional	Primary care	Older adults ≥65	160	NR	Beers 2023	Primary care

Prevalence of Potentially Inappropriate Medications:-

Prevalence of exposure to at least one potentially inappropriate medication (PIM) varied substantially across included studies, reflecting differences in care setting, patient complexity, and study design. Point prevalence ranged from 40.6% in primary care cohorts to 82.4% in longitudinal dispensing and hospitalized populations. Hospital-based studies consistently reported higher prevalence; for example, in the Tabuk multicenter inpatient study, 81.4% of hospitalized older adults were prescribed at least one PIM, with a large proportion of total prescriptions classified as potentially inappropriate. Given heterogeneity in setting and criteria versions, prevalence is best interpreted as a range rather than a single pooled national estimate. A structured summary of prevalence ranges, key predictors, and commonly implicated medication classes is presented in Table 3.

Table 3: Summary of Main Findings

Outcome	Pooled / Range Findings
Prevalence of ≥1 PIM	Range: 40.6% – 82.4%
Approximate weighted prevalence*	~61–64%
Highest prevalence	Hospitalized and longitudinal cohorts (81–82%)
Lowest prevalence	Primary care and frailty-focused studies (~40–46%)
Most common PIM classes	Proton pump inhibitors, NSAIDs, benzodiazepines, antipsychotics, anticholinergics

Polypharmacy prevalence	47% – >80% depending on setting
Strongest predictor	Polypharmacy (AOR range ~4.3 to 23.9)
Other consistent predictors	Age, comorbidity burden, frailty, psychiatric diagnosis
Sex differences	Female sex is associated with higher PIM risk in some primary care studies.
*Weighted prevalence calculated using sample-size weighting across studies reporting point prevalence.	

Ambulatory and community-based studies had intermediate prevalence values. In the national outpatient cohort of more than 23,000 people, the prevalence of the condition varied from 57.2% to 63.6% annually over a period of 3 years. Home health care recipients showed a prevalence of 58.4%, and disease-specific ambulatory cohorts, such as diabetes and hypertension, showed a prevalence close to 50%. Descriptive sample-size–weighted prevalence calculations across studies reporting point estimates suggested that prevalence commonly clustered between approximately 61% and 64% in large outpatient and community-related cohorts. However, because of substantial heterogeneity across care settings and criteria versions, this value should be interpreted as a descriptive summary rather than a formal pooled meta-analytic estimate.

Trajectories and Temporal Patterns:-

The longitudinal trajectory study identified distinct patterns of PIM exposure over time. Approximately 55.9% of the cohort followed a persistent high-PIM trajectory, while 16.2% demonstrated decreasing exposure over time; only a minority maintained consistently low exposure. These findings suggest that PIM exposure in older adults may be sustained rather than transient, particularly among individuals with high medication burden and multimorbidity.

Outpatient settings Temporal trend analysis indicated that the prevalence of PIM in 2018 and 2019 was significantly higher than it was in 2017, which is also reflected in a concomitant increase in the prevalence of polypharmacy, increasing from about 47% to above 55. This alignment is consistent with a direct association between the rise in medication count and inappropriate prescribing.

Predictors of PIM Use:-

Polypharmacy was the strongest and most consistently reported predictor across settings. Adjusted odds ratios ranged from approximately 4.3 in primary care cohorts to nearly 24 in large outpatient database analyses. In the longitudinal trajectory study, polypharmacy markedly increased the likelihood of belonging to a persistent high-PIM exposure group. Multimorbidity also demonstrated a dose–response relationship, with each additional diagnosis associated with increased odds of PIM exposure in longitudinal analyses and substantially higher risk in frail inpatient populations.

Age was a weak but significant predictor, especially in primary care and family medicine clinics, where each five-year increase in age was associated with an increase in the odds of PIM by about 40-50%. Female sex was found to be associated with higher exposure to PIM in some ambulatory studies, although this was not the case in all studies, and this association was not seen in inpatient cohorts. Psychiatric diagnosis made a significant difference to risk. In psychiatric outpatient samples, dementia was respectively linked to significantly higher use of antipsychotic PIMs, and schizophrenia and anxiety diagnoses were linked to lower odds of receiving potentially inappropriate psychotropic agents.

Medication Classes and Clinical Context:-

In various studies, a set of uniform medication classes explained most PIM exposures. The most commonly identified PIMs were proton pump inhibitors, and they impact up to half of hospitalized patients and more than one-third of ambulatory patients. There was also repeated identification of NSAIDs, benzodiazepines, and diuretics. In psychiatric and dementia-specialty research, atypical antipsychotics were the predominant PIM prescribers, and

quetiapine, risperidone, and olanzapine were overprescribed to dementia patients.Clinical burden was also further emphasized by the number of PIM distributed. Two or more PIMs were exposed to between 15 and 20 percent of patients in various cohorts, and as many as 17 percent of hospitalized patients were exposed to three or more. These trends emphasize the cumulative prescribing risk and not individual inappropriate decisions.

System-Level Factors and Secondary Outcomes:-
System-level contributors were not as commonly quantified, but they manifested indirectly by way of setting comparisons. Higher PIM prevalence was attributed to hospitalization, enrolling in home health care, and psychiatric specialty care than general primary care. The frailty status was a risk factor on its own, despite the number of medications and burden of comorbidity, indicating that physiological vulnerability is a risk factor for prescribing that cannot be explained by disease burden alone.

Summary of Objectives:-
Regarding the main objective, the evidence collected together shows that about two-thirds of Saudi older adults have at least one potentially inappropriate drug, and much greater disease rates are found in hospitalized, frail, and psychiatrically complicated groups. In terms of secondary goals, they revealed that patient-level factors, including polypharmacy, age, sex, comorbidity burden, frailty, and particular psychiatric diagnoses, were consistently predictors of PIM exposure as opposed to clinical context and care setting, which served as crucial system-level modifiers of risk.In general, the evidence base reveals that the burden of inappropriate prescribing in older adults in Saudi Arabia is high and consistent, and there is much quantitative evidence indicating that polypharmacy and multimorbidity are the prevailing drivers of inappropriate prescribing. These results indicate the effectiveness of specific deprescribing interventions and prescribing protection at the system level, especially in the case of older adults with mood and anxiety disorders and patients treated in high-intensity care facilities.

Discussion:-

Saudi studies consistently demonstrate a high burden of potentially inappropriate medications (PIMs) among older adults, with most large outpatient cohorts reporting prevalence exceeding 50%. Higher prevalence is frequently observed in psychiatrically complex populations and in high-intensity care settings, including inpatient and specialty services. Large, outpatient care, tertiary care analyses from Riyadh report that between 57.2% to 63.6% of adults aged 65 years and older were prescribed at least 1 PIM in a single year with a measurable upward trend across 2017 to 2019, despite increasing global awareness on principles of deprescribing [3]. Similar prevalence estimates have been found for ambulatory geriatric clinics based on the use of the 2015 AGS Beers Criteria, indicating that high PIM exposure is not limited to the hospitalized population but represents routine prescribing practices in the outpatient setting in Saudi Arabia [1]. When analyses focus specifically on older persons with psychiatric diagnoses, the prevalence is equal to or higher, and the medication profile more concerning: a national study of older persons with anxiety disorders found that the prevalence of PIMs was 66.6% among 371 patients, with a mean number of medications more than six per patient and a statistically significant increase in the prevalence of PIM exposure among women and those with diabetes or cancer [10], and a psychotropic-focused outpatient study that included approximately 1,300 older psychiatric patients found that 68% of the patients These Saudi psychiatric cohorts are not only different in prevalence but also in composition as psychotropics (e.g., tricyclic antidepressants, first-generation antipsychotics, and sedative-hypnotics) are prominent along with non-psychiatric PIMs (e.g., NSAIDs, proton pump inhibitors, and select cardiovascular agents) [5][10].

In all the Saudi studies, polypharmacy is the strongest and most reliable predictor of PIM exposure, with patients on five or more drug classes showing significantly higher odds of at least one PIM, in some studies by over 10 times compared to patients on fewer than 3 drugs [1][3][10]. While this association is unsurprising from a mechanistic standpoint, the magnitude of the association would suggest that inappropriate prescribing in older adults is not a result of isolated prescribing errors, but rather a function of cumulative system-level processes such as fragmented care, poor medication reconciliation, and additive prescribing without structured review for deprescribing. Multimorbidity further adds to this risk, especially cardiometabolic disease, cancer, and neurological disorders, all of which are independent predictors of PIM exposure in Saudi data sets, the convergence of complex chronic disease management and guideline-based prescribing that often ignore geriatric vulnerability [1][3]. Female sex has also been repeatedly linked to higher PIM prevalence in Saudi older adults, which is consistent in both psychiatric and non-psychiatric samples, and is likely mediated by longer life expectancy as well as higher rates of anxiety, depression, and exposure to CNS-active medications [10]. In psychogeriatric populations, additional predictors include dementia and other neurological comorbidities, which markedly increase the propensity of receiving

anticholinergic or sedating medications despite their well-established association with falls, delirium, and cognitive deterioration [5][2]. Critically, there seems to be a dual prescribing burden for CNS polypharmacy in Saudi psychiatric cohorts: CNS polypharmacy seems to be tacitly accepted as a pragmatic solution to refractory symptoms of mood and anxiety conditions, and the parallel treatment of somatic comorbidities introduces further non-psychotropic PIMs, which create a risk of layered pharmacological problems rather than the single-drug problem [5]. From a methodological point of view, the Saudi literature is mainly retrospective electronic health record studies, designed in a single tertiary center or in a single region, yielding useful signals for prevalence estimates and valuable for showing and confirming related factors but lacking generalizability, especially in primary care settings and/or rural areas, with community-dwelling older adults, particularly in view of the underrepresented use of over-medication by OTC medication and/or non-prescription NSAIDs, as well as factors that are known to contribute to a high burden of PIMs [1][3].

Heterogeneity in screening tools further causes interpretation issues, given that studies use different versions of the Beers Criteria, or Beers plus local adaptations, a limitation that is highlighted by global evidence obtained from meta-analytic studies showing substantial variation in the prevalence of PIM depending on the type of criteria and version applied [11]. Furthermore, the problem of retrospective dependence on diagnostic coding distorts the clinical context, i.e., some of the medications that are described as potentially inappropriate could have had a justifiable clinical interpretation, which supports the argument of clinician-driven adjudication over inflexible algorithmic deprescribing. Nevertheless, international randomized and quasi-experimental interventional evidence shows that pharmacist-led medication reviews, multidisciplinary deprescribing interventions, and structured prescribing feedback have strong and significant effects on reducing the number of medications and exposure to PIM, with modest individual-level effect, which produces significant benefits at the population level [12]. Taken together, the Saudi evidence supports older people with mood and anxiety problems as a high risk, high yield population for targeted reduction of PIMs encouraging focused medication review in individuals with polypharmacy, multimorbidity, recent specialist prescribing or documented falls or cognitive decline and the need to use combined screening approaches that use the Beers criteria alongside the tools that focus on interactions such as STOPP/START to better reflect the complexities of geriatric psychiatric care.

Strengths and Limitations:-

Strengths:-

This review has a number of notable strengths. First, it is the first systematic review to specifically synthesize evidence on PIMs among older adults in Saudi Arabia, which will provide a very important national evidence base for clinicians and policymakers. A strict, protocol-based methodology was used in the review that follows PRISMA to conduct comprehensive searches in international and regional databases as well as select independent studies. By limiting studies to those using explicit and internationally recognised criteria (Beers/STOPP), it ensured a standardised and reproducible assessment of outcome. Moreover, the analysis was conducted with the scope of more than mere prevalence to generalize the quantitative predictors and medication patterns of classes to provide executable information on the forces and structure of inappropriate prescribing in this vulnerable group.

Limitations:-

The findings should be interpreted in the context of a number of limitations. Significant clinical and methodological heterogeneity existed between included studies, resulting from differences in the care settings (primary to tertiary care), versions of the Beers criteria, and patient populations. This heterogeneity, although tackled by random-effects meta-analysis, partly accounts for the large range of prevalence estimates and makes it difficult to come up with accurate pooled estimates. The evidence used is all observational, restricting the causation of predictors. The predictor synthesis, although useful, is limited by the adjustment of variables of confounders in the studies; important variables such as severity of frailty, functional status, and the suggestion of use are sometimes not measured, hence, potential residual confounding. There is also a potential for selection bias, as the majority of studies were undertaken in tertiary or urban settings and may therefore not represent rural and community-dwelling older adults or represent individuals with greater clinical complexity and polypharmacy. Finally, the use of prescribing data, which lacks clinical adjudication, may lead to misclassification of some clinically justified treatments as PIMs, especially in the case of psychiatric and palliative care.

Recommendations:-

For Clinical Practice in Saudi Arabia:-

Immediate and structured interventions are needed in clinical settings caring for older people, especially those with mood and anxiety disorders. We would suggest: 1) Making Beers and STOPP/START criteria mandatory in clinical decision support systems in the electronic health records of all regions to offer real-time prescriber advice. 2) The use of multi-disciplinary medication review protocols, spearheaded by clinical pharmacists in collaboration with psychiatrists and geriatricians, particularly among patients with polypharmacy (=5 medications) or among patients with certain high-risk diagnoses (e.g., dementia). 3) Targeted education for prescribers in geriatric psychopharmacology, and the principles of deprescribing, focusing on safer alternatives to high-risk classes of medication, such as benzodiazepines, anticholinergic antipsychotics, and long-term proton pump inhibitors

For Saudi Health Policy:-

System-level reforms are needed to help translate evidence into sustained quality improvements. Key policy recommendations include: 1) Incorporating PIM reduction measures (e.g., proportion of patients aged >=65 years old on high-risk medications) into the national performance and quality measures monitored by the Saudi Health Council and the Center for Healthcare Quality. 2) The production and dissemination of national context-specific deprescribing guidelines based on the Saudi formulary and prevalent disease patterns and endorsed by the Saudi Food and Drug Authority and the Saudi Geriatrics Society. 3) Examining regulatory and reimbursement approaches that promote medication review and deprescribing, potentially under the new models of value-based care.

For Saudi Research:-

To fill important evidence gaps, future Saudi-based research will need to focus on: 1) Longitudinal and Interventional Studies: Prospective cohort studies to assess the impact of PIMs on hard outcomes (hospitalizations, falls, mortality) in geriatric psychiatric patients, and quality intervention trials (e.g., cluster-randomized trials) to test the effectiveness of pharmacist-led reviews in outpatient psychiatric clinics. 2) Qualitative and Mixed-Methods Research: Exploration of barriers and facilitators to deprescribing from patient, caregiver, and healthcare provider perspectives to develop culturally appropriate interventions. 3) Broader Scope: Studies that incorporate the use of over-the-counter medication, represent rural populations, and incorporate combined screening tools (Beers with STOPP/START or drug-drug interaction checkers, for example) that will better capture multifaceted prescribing risk.

Conclusion:-

This systematic review shows that potentially inappropriate medication use is not a fringe issue in Saudi geriatric psychiatry but a major characteristic of routine care. Across a group of over forty thousand elderly, approximately two-thirds were exposed to at least one PIM, although the rates are even higher in populations of hospitalized, frail, and psychiatrically complex elderly. The consistency of this signal across national databases, outpatient clinics, and psychiatric cohorts shows that inappropriate prescribing reflects structural features of care rather than isolated clinical error.

Polypharmacy was the leading cause of risk, often attributed to the effects of age, multi pathology, and psychiatric disease. Older adults with mood and anxiety disorders are especially at risk because they are on long-term psychotropics in addition to cardiometabolic and neurological therapies, and become victims of stacked pharmacological damage. The predominance of benzodiazepines, antipsychotics, proton pump inhibitors, and anticholinergics is further evidence of prescribing practices that focus on symptomatic control with little consideration for long-term safety.

For Saudi Arabia, these results are a call for action. Routine usage of Beers and STOPP tools in electronic records, pharmacist-led medication review in psychiatric clinics, as well as national deprescribing guidance aligned to the Saudi formulary, are now clinically and ethically necessary. Without such measures, inappropriate prescribing will continue to undermine the safety and quality of care of a rapidly aging population with increased mental health needs.

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