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RESEARCH ARTICLE

THE IMPACT OF TELEMEDICINE ON PATIENT OUTCOMES, ACCESS TO CARE, AND PATIENT SATISFACTION IN FAMILY MEDICINE: A SYSTEMATIC REVIEW

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Abstract

Telemedicine has emerged as a transformative strategy in healthcare, particularly in family medicine, since it improves patient outcomes, increases access to care, and influences patient happiness. This systematic review aimed to synthesize current evidence on the impact of telemedicine in these areas. The review included studies from multiple databases that focused on telemedicine's function in family medicine throughout the last decade. The findings show that telemedicine considerably improves access to healthcare services, especially in underserved and rural areas. Patients benefit from shorter travel times and better scheduling flexibility, which has been especially important during the COVID-19 pandemic. However, the effects on patient outcomes are variable. While some studies show lower mortality rates and shorter hospital stays in telemedicine-supported care, others show an increase in acute care visits for illnesses that might be treated in outpatient settings. Patient satisfaction is generally high, particularly about the convenience of telemedicine, but this is offset by worries about the quality of care in non-face-to-face contacts. Physician perspectives differ, with some expressing displeasure with the perceived lower quality of telemedicine visits compared to in-person consultations. These findings imply that, while telemedicine has enormous potential for improving healthcare delivery in family medicine, it must be carefully integrated into existing healthcare systems to maximize its benefits. Future research should focus on hybrid care models and solutions for addressing gaps in telemedicine access and outcomes.

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Introduction:-

The healthcare industry has been revolutionized by the rapid evolution of technology, with telemedicine being a significant part of today's healthcare system[1]. Telemedicine is defined as the use of electronic communication and information technologies to provide and support remote health services, which has expanded significantly in recent years[2]. Telemedicine eliminates the need for in-person visits, employing secured audio and video links for remote clinical appointments, expert consultations, medication management, and more[2,3]. Various formats are used, including telephone calls and electronic devices known as peripherals for remote monitoring, as well as synchronous and asynchronous telehealth[3].

The COVID-19 pandemic particularly sped up this growth due to minimizing face-to-face contact as a way of avoiding transmission risks[4–6]. Consequently, telemedicine has become one of the main tools for sustaining continuous care, especially in family medicine, which is based on apatient-centered comprehensive approach.As an area of primary healthcare, family medicine provides holistic, continual and comprehensive medical care to individuals and families, irrespective of age or sex or any other disease type[7]. Integration of telemedicine into family medicine practice has the potential to transform patient care by increasing access, improving health outcomes and raising patient satisfaction levels[8,9]. However, an evaluation of these critical components and how they are affected by telemedicine is required to establish whether it works well or whether there are places for improvement.Telemedicine technologies include audio and video channels for remote clinical appointments, expert consultations, and drug management[2,3]. These allow real-time interactions between patients and healthcare professionals through video conferencing, facilitating direct communication, medical expertise exchange, disease diagnosis, treatment planning[3], and disease management, as well as collecting and transferring health data for review by healthcare professionals. Telemedicine uses electronic consults to make patient records available to specialist physicians, reducing the need for in-person specialist appointments[10–12].

Patient outcomes serve as the basic determinant for evaluating efficiency in any form of health intervention. In relation to telemedicine, it is important to establish if remote consultations have equal or superior clinical results compared with those carried out through traditional person-person visits. These include the management of chronic illnesses, among others like acute diseases and preventive measures. The impact of telemedicine in improving patient outcomes, access to care, and patient satisfaction in family medicine is still an open subject that needs to be further investigated.Therefore, this systematic review aimed to compile the latest evidence available on the impact of telemedicine interventions on patient outcomes, access to care, and patient satisfaction in family medicine settings.The findings would provide insights into benefits along with challenges related to telemedicine to inform future practice and optimize the benefits of telemedicine in family medicine.

Methodology:-

Search strategy:

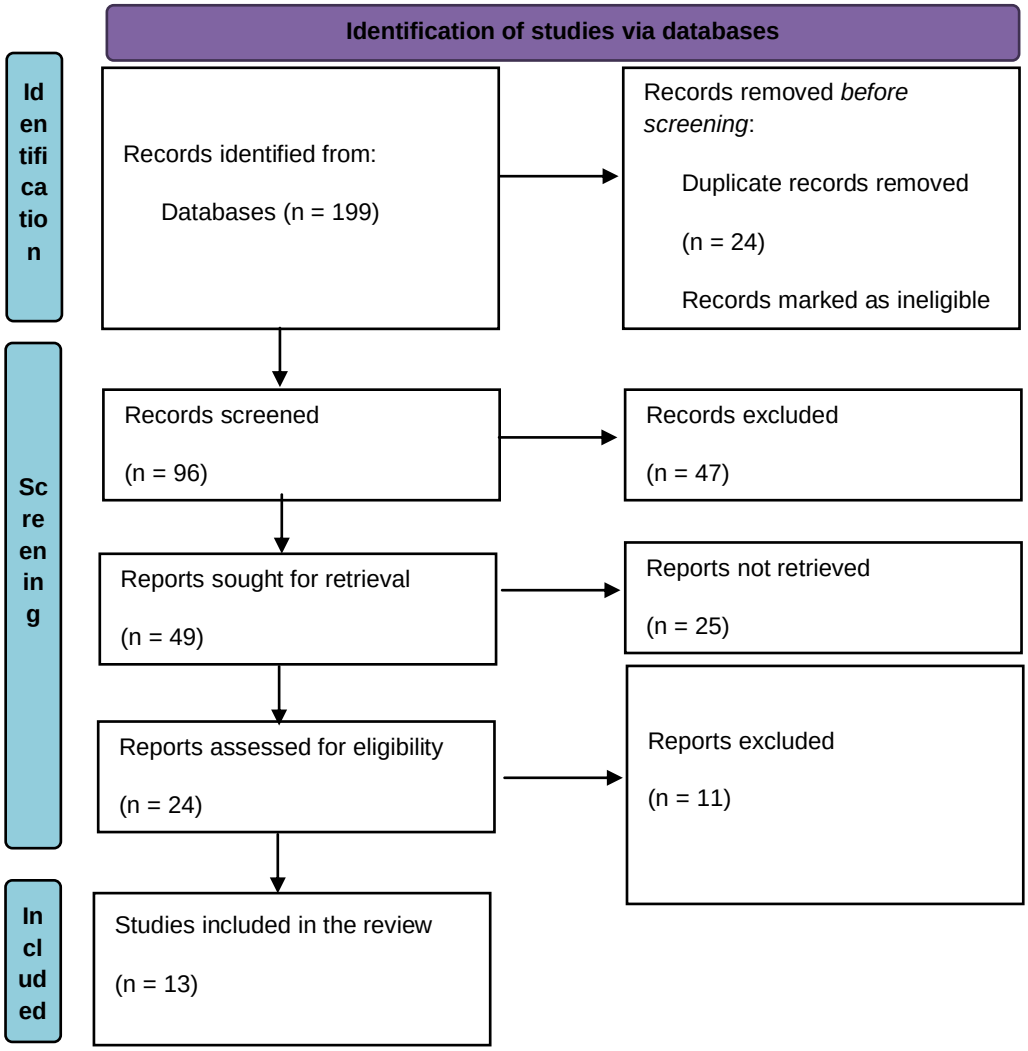
A systematic search was conducted across Ovid MEDLINE, PsycINFO, CINAHL, Scopus, Cochrane CENTRAL, and EMB Review databases. Two reviewers independently screened studies according to predetermined inclusion criteria. The search strategy included a two-stage process. First, a limited search of one PubMedwas conducted to identify keywords contained in the title and/or abstract and subject descriptors, and then used to develop a search strategy. PubMed was initially chosen given the manageable number of returned articles, which allowed us to efficiently and systematically implement published search restrictions. After obtaining the results, the search was extended to all identified databases. Second, the reference list of all potential studies was reviewed and compared to the results of the initial search strategy. Only a Scopus search was also conducted for possible preprints. We included articles from all global locations, so we did not search for records by geographical area. We used the relevant Medical Subject Headings (MeSH), such as "Telemedicine,""Telehealth,""Teleconsultation," and "eHealth."to access a broad range of relevant articles.In addition to MeSH terms, we used free-text keywords, such as "Telecare Services," and "Digital Health,"to identify relevant articles that may not use MeSH terms. We then combined search terms using Boolean operators (AND, OR) to optimize the search results. This combination let to these search keywords: ("Telemedicine" OR "Telehealth" OR "Remote consultation") AND ("Patient outcomes" OR "Health outcomes" OR "Clinical outcomes") AND ("Access to care" OR "Healthcare access") AND ("Patient satisfaction" OR "Patient experience") AND ("Family medicine" OR "Primary care"); (Telemedicine [MeSH] OR Remote Consultation [MeSH]) AND (Treatment Outcome [MeSH] OR Health Status [MeSH]) AND (Health Services Accessibility [MeSH] OR Healthcare Disparities [MeSH]) AND (Patient Satisfaction [MeSH]) AND (Family Practice [MeSH] OR Primary Health Care [MeSH]).

The PICOS criteria for inclusion of literature were: the population is family medicine or primary care patients; the intervention is telemedicine; outcomes are patient satisfaction, access to care, and patient outcomes; and the study can be a systematic review, meta-analysis, or randomized controlled trial. Outcome measures may include patient satisfaction, accessibility of care, and patient outcomes.

Study Selection

We selected all studies that were English-language peer-reviewed journal articles written in the English language. Eligible studies includedRandomized Controlled Trials (RCTs), cohort studies, case-control studies, and prospective/retrospective studies reporting on the influence of telehealth or telemedicine on patient outcomes. Due to the rapid growth of telemedicine technologies and the recent widespread usage of digital/smart technologies in healthcare, which also influenced the adoption of telemedicine, only studies published in English during the last decade were examined, taking into consideration current advancements in telemedicine technology. Exclusion criteria included duplicate research, editorials, letters to the editor, opinion pieces, narrative and scope reviews, theses, and non-peer-reviewed works. Studies that reported exclusively on telemedicine intervention from the perspective of a healthcare professional, specifically comparing satisfaction, outcomes or measures related to the adoption of technology in their practice, were excluded.

After selecting possibly relevant articles, full-text publications were obtained and reviewed for suitability. Two systematic reviewers assessed article titles and abstracts according to inclusion criteria. Full-text articles of potentially relevant studies were then evaluated for systematic inclusion by one reviewer and verified by another. Any disagreements among the reviewers were settled through conversation, with a fourth reviewer stepping in as needed. Figure 1 displays the process of selecting included studies based on Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) criteria.



Data Extraction and Quality Assessment

We built the data extraction form to capture the primary author's name, publication year, study design, and major findings of relevance. Four reviewers extracted data separately, resolving any disagreements between their decisions on the quality assessment through discussion or, if necessary, collaboration with a fifth reviewer. The methodological quality of the included studies was appraised using the appropriate tools. These tools included the Cochrane Risk of Bias tool[13], for randomized controlled trials, the Newcastle-Ottawa Scale for observational studies [14], and the National Institutes of Health (NIH) Study Quality Assessment Tools[15] for other study types. The potential sources of bias within the studies were meticulously scrutinized. Moreover, we also used the PRISMA subdomain on quality of evidence and the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) criteria [16]for quality assessment.

Narrative synthesis and reporting

For the synthesis and reporting of the data, a detailed a priori strategy was followed. A narrative synthesis of study findings was presented, and in the discussion, this narrative synthesis aligns findings from this systematic review with the broader literature base. Where measures of the impact of telemedicine were reported in study results, they are detailed in Table 1 and synthesized narratively.

Results:-

As indicated in Table 1, the 12 studies have been conducted across various research designs, including cross-sectional, cohort, mixed-methods, qualitative, and propensity score-matched cohort studies. Five cross-sectional studies focused on measuring outcomes, satisfaction, attitudes, and perceptions of telemedicine among patients or physicians[17–21]. Two cohort studies followed groups of patients over time to assess outcomes such as telemedicine usage and acute care visits[22,23]. A retrospective observational study evaluated the impact of telemedicine on patient outcomes such as mortality and length of stay[24]. One mixed-methods study evaluated the use of telehealth social work encounters in primary care[25]. Three qualitative studies explore patient and provider experiences with telemedicine, focusing on themes such as access to care and the patient-provider relationship[26–28]. Then, one propensity score-matched cohort studycompared outcomes between patients who had virtual visits with their own physician and those who had an outside physician[29]. In general, these studies addressed themes such as the effectiveness of telemedicine in delivering care, patient satisfaction, accessibility of telemedicine services, and challenges related to technology, communication, and clinical appropriateness.

Table 1:- Characteristics of the included studies.

Authors	Year	I. Title	Study design	Summary of findings
Zacay et al. [17]	2024	**II.** "A day in the life" – telemedicine in family medicine and its relationship with practicing physicians' satisfaction: a cross-sectional study	Cross-sectional nationwide descriptive study	The study found that the perceived medical quality of visits focused on medical tasks was lower for non-face-to-face visits and administrative tasks for remote asynchronous visits. No association was found between medical quality and patients, physicians, or clinic characteristics. However, the inappropriateness of the visit modality was associated with lower medical quality. A correlation was found between perception of medical quality and physicians' feelings at the end of visits.
Adepoju et al. [22]	2022	**III.** Associations between Patient- and Provider Level Factors, and Telemedicine Use in Family Medicine Clinics	Retrospective Cohort Study	The study involved 37,428 patients with 106,567 primary care encounters, with 57% being Hispanic, 28% non-Hispanic White, and 11% non-Hispanic Black. Non-Hispanic White patients had 61% higher odds of telemedicine visits compared to Hispanics, while non-Hispanic Black patients had 32% higher odds. Uninsured patients had lower odds, while those in metropolitan or underserved areas had higher odds. Provider characteristics were not

				significantly associated with telemedicine use.
Armaignac et al. [24]	2018	**IV.** Impact of Telemedicine on Mortality, Length of Stay, and Cost Among Patients in Progressive Care Units: Experience From a Large Healthcare System	Retrospective observational study	The study showed that the telemedicine intervention led to a significant reduction in mortality both in the progressive care unit and the overall hospital setting (both $p<0.001$). This improvement was observed even though older patients, with more severe illnesses and a higher risk of mortality. Mean progressive care unit length of stay was lower among the intervention group patients compared to those without telemedicine intervention (2.6 vs 3.2 days). Interestingly, the increased length of stay after leaving the progressive care unit and the total direct costs, including telemedicine expenses, were higher but corresponded with better survival rates. Therefore, the telemedicine intervention effectively reduced mortality and length of stay in the progressive care unit without significant additional costs.
Li et al. [23]	2022	**V.** Association Between Primary Care Practice Telehealth Use and Acute Care Visits for Ambulatory Care–Sensitive Conditions During COVID-19	Cohort study	It was observed that a high level of primary care telehealth utilization resulted in an increase of 2.10 additional ED visits or hospitalizations for conditions that could have been managed in an outpatient setting, per 1,000 patients annually, when compared to practices with minimal telehealth usage.
Waschkau et al. [18]	2020	**VI.** Evaluation of attitudes towards telemedicine as a basis for successful implementation: A cross-sectional survey among postgraduate trainees in family medicine in Germany	Cross-sectional study	The majority of participants believe that only a small fraction of telemedicine technology is being used, with data safety being the largest barrier. Over half believe telemedicine will change doctor-patient relationships. 51% are interested in telemedicine training, with 27% of postgraduate trainees expressing that rural practice could be facilitated by telemedical backup for family physicians.
Fipps et al. [25]	2022	**VII.** Expanding Access to Social Support in Primary Care via Telemedicine: A Pilot Study	Mixed Methods study	A pilot study on 22 telehealth social work encounters in primary care found positive feedback from patients, providers, and staff. The study found tablet-based triage to be an acceptable and valued resource in busy practices.
AlFawaz et al. [20]	2023	**VIII.** Experiences with telemedicine among family medicine residents at King Saud university medical city during the COVID-19 pandemic: a cross-sectional study	Cross-sectional study	The study found that 71.7% of participants preferred in-person visits during residency training, while only 10% preferred telemedicine. 76.7% accepted telemedicine clinics if less than 25% of the program. Telemedicine provided less clinical experience, supervision, and discussion time, but 68.3% gained communication skills.
Asiri et al. [21]	2024	**IX.** Impact of electronic health services on patient satisfaction in primary health care centers in Southwestern Saudi Arabia	Cross-sectional study	Married individuals accounted for 69.5% of all respondents. Sehhaty is the most commonly used electronic application (88.8%), and it was selected by the majority of candidates (73.5%). The majority of participants (71.5%) say they are satisfied with the care they received during their visit. Females reported

				higher levels of satisfaction, but those with higher educational degrees were less satisfied with electronic health services (EHS).
Ho et al. [27]	2023	**X.** Perceived Impact of Virtual Visits on Access to Care in Family Medicine During the COVID-19 Pandemic: A Qualitative Study of Benefits and Challenges	Qualitative study	The findings demonstrate how virtual visits increase access to care by improving flexibility for both patients and clinicians while also providing a different perspective on a patient's home life. Language obstacles, technology issues, and issues specific to vulnerable patient populations are also potential challenges of virtual visits.
Alqahtani et al. [19]	2022	**XI.** Physicians' satisfaction with telehealth services among family physicians in Cluster 1 hospitals	Cross-sectional study	A study found that telemedicine significantly reduced travel time, improved job effectiveness and performance, and increased productivity. The majority were male (74.8%), with a mean age of 31.14 years. Telemedicine was deemed important by 61.6% of physicians, and 53.6% appreciated its use due to shared values.
Andreadis et al. [26]	2023	**XII.** Telemedicine Impact on the Patient–Provider Relationship in Primary Care During the COVID-19 Pandemic	A qualitative study	Patients said that telemedicine influenced clinicians' attentiveness in a variety of ways, while providers acknowledged that telemedicine provided unique insight into patients' lives and living situations. Finally, both patients and providers reported communication difficulties.
Arsenault et al. [28]	2024	**XIII.** Telemedicine visits requiring follow-up in-person visits at an urban academic family medicine centre	Retrospective chart review study	The study found that 9.6% of 2,138 telemedicine patient visits were incomplete, with patients with lumps and bumps and those seen by resident physicians having higher odds of incomplete visits. Telemedicine visits at family medicine clinics had lower odds of incomplete visits compared to community clinics, which provide urgent care without relational continuity.
Lapointe-Shaw et al. [29]	2024	**XIV.** Virtual Visits With Own Family Physician vs Outside Family Physician and Emergency Department Use	Propensity score–matched cohort study	Most (79.8%) had a virtual encounter with their own physician, while 20.2% had an encounter with an outside physician. Patients who saw an outside physician were 66% more likely to visit an emergency department within 7 days than those who had a virtual visit with their own physician. The increase in the risk of emergency department visits was greater when comparing patients with telemedicine visits with their own physician visits. The risk difference was 4.1%.

Patient satisfaction and physician experience:

Several studies explored the impact of telemedicine on satisfaction levels. For instance, **Asiri et al.** [21]found high satisfaction rates (71.5%) among patients using electronic health services, though this was nuanced by demographic factors like gender and education level, with females generally reporting higher satisfaction. On the other hand, physician satisfaction varied. **Zacay et al. [17]**noted that physicians perceived lower medical quality in non-face-to-face visits, particularly when the visit modality was deemed inappropriate, which negatively influenced their satisfaction. Similarly, **AlFawaz et al.[20]** reported that while telemedicine was accepted by some family medicine residents, many preferred in-person visits, citing better clinical experience and supervision during these encounters. The majority of participants believe that telemedicine technology is underutilized, with data safety being the main

obstacle. Over half believe it will change doctor-patient relationships. 51% are interested in telemedicine training, and 27% believe rural practice could benefit from telemedical backup [18,25].

Access to care:
Telemedicine has played a significant role in expanding access to care, particularly during the COVID-19 pandemic. **Ho et al.** [27]highlighted that virtual visits increased access by providing greater flexibility for both patients and clinicians, although they also introduced challenges such as language barriers and technological issues. Similarly, **Alqahtani et al.[19]** found that telemedicine reduced travel time for patients and improved job effectiveness for physicians, contributing to greater accessibility, especially in underserved areas, as noted by **Adepoju et al.[22].**

Patient outcomes:
The impact of telemedicine on patient outcomes was mixed. **Armaignac et al.[24]** demonstrated that telemedicine interventions in progressive care units significantly reduced mortality and length of stay without substantially increasing costs, indicating positive patient outcomes. However, other studies like **Li et al.** [23]revealed that higher utilization of telehealth in primary care correlated with an increase in acute care visits for conditions manageable in outpatient settings, suggesting that telemedicine might sometimes contribute to inadequate management of certain conditions.

Challenges and considerations:
The studies also highlighted various challenges in implementing telemedicine effectively. Two studies both pointed out that while telemedicine offers unique insights into patients' home environments, it also presents communication difficulties and risks of incomplete visits, particularly in complex cases requiring in-person follow-up [26,28]. These findings suggest that while telemedicine enhances certain aspects of care, it cannot fully replace in-person visits, particularly for conditions requiring detailed physical examinations.

Overall, the review underscores telemedicine’s potential to improve access and some aspects of patient care in family medicine but also emphasizes the need for careful consideration of its limitations and the contexts in which it is deployed. Then, one propensity score-matched cohort studycompared outcomes between patients who had virtual visits with their physician and those with an outside physician. They found that patients who saw an outside physician were 66% more likely to visit an emergency department within 7 days than those who had a virtual visit with their own physician. The increase in the risk of emergency department visits was greater when comparing patients with telemedicine visits with their own physician visits [29].

Discussion:-

The findings of this systematic review on the impact of telemedicine in family practicefound varied levels of satisfaction with telemedicine, with most patients being satisfied, which is consistent with earlier studies. A previous systematic review and meta-analysis found that patients were generally satisfied with telemedicine, particularly in terms of ease and accessibility[30]. However, discontent was more common among highly educated patients, which is similar toprevious evidence that patients with higher education levels were concerned about the limitations of virtual treatment, such as decreased human interaction[31].

This review found good feedback from patients, but physicians expressed worries about the quality of care in non-face-to-face contacts. This contrasts with previous research, which found that physicians generally have good attitudes toward telemedicine. For example, previous studies showed that despite initial skepticism, many physicians considered telemedicine adequate, particularly in terms of accessing marginalized communities[32]. However, the persistent concerns about the appropriateness of visit modalities raised in the current review show that these positive opinions may not be universal or may vary depending on the form of telemedicine used.

This review's findings that telemedicine improves access to care are backed by previous literature. For example, previous systematic reviews have shown that telemedicine might bridge care gaps, particularly in rural and underserved regions, by overcoming geographical constraints[33,34]. This is supported by our findings that virtual hospital visits improved access by providing better flexibility and increased telemedicine utilization among patients in rural or underserved locations. Though we found the benefits of enhanced access, substantial challenges, such as technical and linguistic barriers, were also identified. This sophisticated perspective differs from previous studies, which frequently focused on the benefits of access without delving deeply into the challenges. For example,

Bashshur et al. [35]emphasized telemedicine's potential to enhance care access but did not explore technological and linguistic barriers that could impair its effectiveness.

This review found that telemedicine had a mixed impact on patient outcomes, such as reduced mortality and length of stay, which are consistent with findings from previous studies, which demonstrated that telemedicine could effectively reduce hospital admissions and improve chronic disease management[33,36,37]. However, we also found possible downsides, including an increase in acute care visits for diseases that may be treated in outpatient settings. This contrasts with the findings of Ashwood et al., who hypothesized that telemedicine could minimize emergency department visits by delivering prompt care for ambulatory care-sensitive illnesses[38]. The disparity could be attributable to disparities in the deployment of telemedicine services, patient groups, or illnesses being addressed.

All of these findings, compared to previous studies, highlight the context-dependent effectiveness of telemedicine. While it improves access and convenience, its effectiveness appears to be dependent on the unique healthcare context, patient demographics, and type of service provided. This is consistent with the "fit between technology and task" theory proposed by Goodhue and Thompson[39], which states that the efficacy of technology use in organizations is determined by how well the technology matches the tasks it is designed to serve. Thus, telemedicine may be more effective in certain situations (e.g., routine follow-ups, chronic disease care) than others (e.g., initial diagnoses, complex cases).Hybrid care methods, combining telemedicine and in-person appointments, are becoming increasingly important. Our findings highlight that telemedicine may not totally replace in-person care, particularly in cases needing physical inspection. This is supported by advocates for a hybrid paradigm that capitalizes on the strengths of both telemedicine and face-to-face encounters, hence improving patient outcomes and satisfaction[40,41]. A study conducted among family physicians and community paramedics showed that a hybrid model was associated with positive physician experiences in two main areas: clinical impacts, especially avoiding unnecessary hospital visits, and physician satisfaction with the service [41]. This is similar to higher satisfaction found among patients who used hybrid models [40,42].

The observed inequalities in telemedicine adoption across demographic groups indicate that, while telemedicine has the potential to democratize access to treatment, it may also unintentionally worsen existing imbalances if not applied carefully. This is consistent with the previously reported discrepancies in telemedicine use, notably among racial and ethnic minorities, low-income groups, and those with little digital literacy[43,44].

This systematic review has some limitations to consider. The study heterogeneity, which includes studies on design, population, and modalities, makes it difficult to synthesize findings and draw broad conclusions. Publication bias, where studies with positive or significant results are more likely to be published, could skew the overall findings. Limited longitudinal data on patient outcomes, satisfaction, and access to care may also limit the ability to assess the sustained impact of telemedicine over time. Additionally, the rapid technological changes of telemedicine technology may make some studies outdated, affecting their ability to fully reflect current practices or potential future advancements. These limitations suggest the need for further high-quality, longitudinal research to better understand the nuanced impacts of telemedicine in family medicine.

Conclusion:-

This systematic review's findings provide a more nuanced knowledge of how telemedicine affects patient outcomes, access to care, and patient satisfaction in family medicine. While telemedicine has obvious advantages, particularly in terms of access, its effectiveness is highly context-dependent, and challenges and barriers associated must be overcome in order to fully fulfill its promise. Hybrid care models and targeted measures to eliminate inequities in telemedicine utilization should be established to maximize its benefits across varied patient populations.

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