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Hospital Care Utilization Patterns Among Migrants and Natives in a Central Italian Region between 2011 and 2023: Findings from the MIGHTY Project (P2022ASXKR)

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SUMMARY

Background: Migration has reshaped the demographic profile of Italian regions, yet evidence on differences in hospital care utilisation between migrant and native populations remains limited, particularly over long periods and across full population cohorts. This study evaluates hospital admissions in the Marche Region from 2011 to 2023 according to citizenship.
Methods: A population-based longitudinal study was conducted using Healthcare Utilization Databases on residents of Marche Region, comparing Italian residents with migrants from High Migratory Pressure Countries (HMPC) and Highly Developed Countries (HDC). Age-standardised all-cause, avoidable, and cause-specific hospital admission rates were estimated. Temporal trends were assessed through Poisson regression models. Hospital care utilisation was evaluated using two-step models: logistic regression for the probability of being hospitalized and Poisson regression for the frequency of admissions among hospitalised individuals.
Results: Across 1.52 million person-years and 2.86 million admissions, HMPC and HDC residents consistently showed lower all-cause, avoidable, and cause-specific admission rates than Italians. Hospitalisations declined over time for all groups, with a marked drop in 2020. Avoidable hospitalisations decreased by 42% in the post-pandemic period. Migrants showed a dual pattern: lower probability of being hospitalised (Odds Ratio, 95% CI: HMPC 0.79, 0.75-0.76; HDC 0.53, 0.51-0.56), but higher admission frequency among those hospitalised (Rate Ratio, 95% CI: HMPC 1.10, 1.09-1.10; HDC 1.04, 1.01-1.07) than Italians.
Conclusion: Migrant populations in Marche show lower hospitalisation rates but higher utilisation once admitted, suggesting possible barriers to early or appropriate access. Monitoring hospital use through administrative databases is essential to identify potential inequities and guide targeted interventions.

Keywords: Migrants; Hospitalization rates; Healthcare utilization; Administrative Databases; Italy

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INTRODUCTION

In 2024, Italy counts over five million regular foreigners coming mainly from high migratory pressure countries (HMPCs) reshaping the demographic composition of many Italian regions. Understanding how migrant populations use healthcare services is essential for monitoring equity, evaluating healthcare system performance, and for informing regional and national planning [1, 2].

Scientific literature documents the difficulties faced by the foreign population in accessing health services, partly due to limited language skills and poor knowledge of the organisation of the health system [3]. Italian regional analyses have demonstrated that migrant populations tend to have lower rates of preventive care and higher rates of inappropriate emergency or avoidable hospital admissions compared with native populations [4, 5].

Hospitalisation rates, avoidable hospitalisations, and cause-specific admissions offer valuable information for assessing the performance of local health systems and identifying potential unmet needs. However, national and regional evidence on migrants is still fragmented in Italy, often limited to specific age groups, diagnostic areas, or short observation periods [4-8], leaving gaps in knowledge on the overall population and long-term trends.

In order to monitor the use of healthcare according to citizenship, Healthcare Utilization Databases are a valuable source of data. Their population-based coverage, longitudinal structure, and systematic standardisation enable the monitoring of healthcare use across large, heterogeneous populations and over extended time periods [9].

In Italy, the National Health Service guarantees free basic healthcare to all residents, regardless of nationality or origin. The regions have autonomy in the management of public health, which can lead to significant territorial differences [10, 11]. The territorial, economic and social structure varies considerably between regions and, moreover, migration flows have affected regional territories with different characteristics and at different times [12, 13]. In this context, it is particularly important to analyse specific regional contexts.

The objective of this study is to estimate and compare hospital admissions between migrant and native populations residing in the Marche Region from 2011 to 2023, using routinely collected Healthcare Utilization Databases. The analysis is conducted within the framework of the PRIN PNRR 2022 project "MIGrants' HealTh and healthcare access in ItalY" (MIGHTY, Prot. P2022ASXKR).

METHODS

Study design, data sources and definition of population groups

This investigation is a population-based longitudinal study based on routinely collected administrative healthcare data. The study period covers 1 January 2011 through 31 December 2023. The target population includes all residents of the Marche Region, a Central Italy area with approximately 1.5 million inhabitants.

Data were obtained from two Healthcare Utilization Databases of the Regional Healthcare System: the Regional Beneficiaries Database (RBD) for demographics and healthcare assistance start and end dates for all residents, and the Hospital Discharge Records (HDR), for hospital admissions, including admission/discharge dates, primary and secondary diagnoses and procedures (International Classification of Diseases, 9th Revision, Clinical Modification, ICD-9-CM).

These datasets were deterministically linked at individual level using a unique anonymous identification code assigned to each resident. All data were processed in compliance with the European (GDPR, EU 2016/679) and national privacy laws (D.lgs. 196/2003 and subsequent amendments).

Residents were annually classified in three population groups according to their citizenship recorded in RBD: residents holding Italian citizenship (Ita-Marche), residents from High Migratory Pressure Countries (HMPC), and residents from Highly Developed Countries (HDC) [14].

The Annual Person-Time Population was used as the reference denominator for rates estimations, as described elsewhere (manuscript submitted for publication) [15]. Specifically, individuals were included if, at any time between January 1st and December 31st of a given year (2011-2023), they had a recorded start date of healthcare coverage before December 31st of the reference year, no recorded date of death or end of coverage (due to moving to another Italian region or abroad) before January 1st of the reference year. For all eligible subjects, the observation time was computed in terms of person-years (py) for each calendar year.

Statistical Analysis

All-cause hospital admission rates were calculated as the number of hospital discharges recorded in a given calendar year divided by the corresponding person-years of residents present in the RBD in the same year and expressed per 1,000 py. To allow for comparability between population groups with different age structures, age-standardized hospital

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admission rates were estimated annually based on citizenship (Ita-Marche, HMPC, HDC) and sex, using the direct standardization method. The Italian resident population according to ISTAT data as of January 1st, 2019, was adopted as the reference standard [16]. Temporal trend in hospital admissions for all causes was estimated using a Poisson multiple regression model, adjusted by population groups and sex, using standard population as an offset. The dependent variable was the number of hospitalizations expected in the standard population. In addition, six univariate Poisson regression models were carried out to estimate the trend in hospital admissions stratified by population group and sex.

Analyses were further extended to assess avoidable hospitalizations and cause-specific admissions (Major Diagnostic Categories, MDCs) both based on the primary diagnosis (ICD-9-CM). Avoidable hospitalisations included those due to worsening chronic conditions, acute conditions, and conditions preventable by vaccines [17]. All rates were standardised for age and stratified by population groups, sex, and by dividing the study period into pre- (2011-2019) and post- (2020-2023) COVID-19 pandemic. To evaluate the association of avoidable hospitalisations and admissions for specific causes with population groups, sex and pre/post-pandemic, Poisson multiple regression models were used. Results from Poisson regression analyses were expressed as mean percentage changes (MPC) and 95% Confidence intervals (95%CI).

The hospital utilization was assessed using two-step models [18]. Firstly, a logistic regression analysis was performed to estimate the probability of experiencing at least one hospitalization, considering hospital admission (hospitalized vs. not hospitalized) as the dependent variable. Secondly, to estimate the frequency of hospitalisation among individuals with at least one hospitalisation, a Poisson regression analysis was used, with the number of hospitalisations per individual as the dependent variable. In both models, independent variables included population group, sex, age group (0-18, 19-44, 45-64, ≥65 years), and pre/post-pandemic period; the time during which a subject remained under observation was included in the models as an offset.

All statistical analyses were conducted using R software (version 4.4.2).

RESULTS

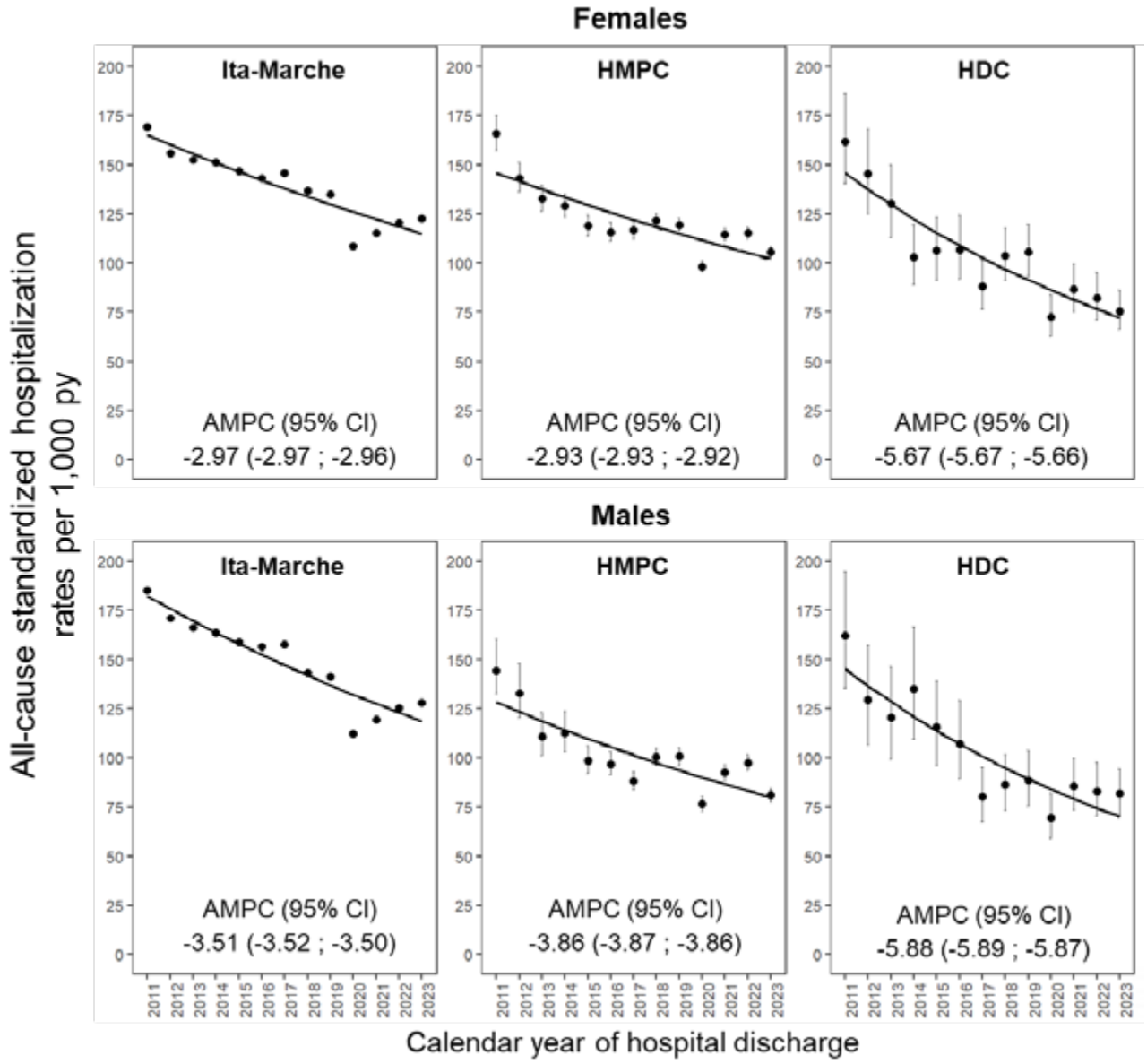
During the study period, a total of 2,856,860 hospital admissions and an average of 1,521,650 person-years were recorded in the Marche Region, resulting in a crude hospitalization rate of 144 admissions per 1000 py. Residents from HMPC and HDC were characterized by crude rates of 97.8 and 95.4 admissions per 1000 py, with 116,409 (7.7%) and 4,974 (0.3%) py, respectively. The HMPC population had a mean age of 36.4 years (SD 18.1) and 55.6% females while the HDC group showed a mean age of 49.0 years (SD 19.1) and 58.9% females. The Italian population was older than HMPC, with a mean age of 47.3 years (SD 24.0) and with a slightly lower proportion of 51.1% females than migrant populations.

All-cause hospital admissions

The standardised hospital admission rates for all causes in the period 2011-2023 were 144, 113 and 105 admissions per 1,000 py for Ita-Marche, HMPC and HDC residents, respectively. The highest rates were observed in 2011 for all population groups, followed by a downward trend in subsequent years and the lowest values in 2020 (Supplementary Table S1). In each stratum considered, rates showed fluctuating courses, with an expected sharp decline in 2020 and a upturn until 2023 for Ita-Marche and until 2022 for the two migrant populations.

Figure 1 shows the estimated annual trends in standardised hospital admission rates for all causes by population groups and sex. Throughout the study period, the Ita-Marche population consistently showed the highest hospitalization rates, although in 2011 the rates for the three female groups were similar. Among women, a clear gradient was observed, with rates highest in Ita-Marche, intermediate in HMPC, and lowest in HDC. Among men, the two migrant groups showed nearly overlapping trends, with a wide gap compared to the Ita-Marche population. The annual mean percentage changes (AMPC) indicated a decrease in hospital admissions across all population groups during the study, with the largest reduction in HDC residents of both sexes, and similar declines among Ita-Marche and HMPC populations (Figure 1).

Figure 1. All-cause age-standardised hospital admission rates and estimated temporal trend by population groups and sex, Marche Region, 2011-2023. Trends were estimated using univariate Poisson regression models with calendar year as the independent variable



***Footnote**: AMPC: Annual mean percentage changes; 95%CI: 95% Confidence Interval; Ita-Marche: Italian citizenship residents in Marche; HMPC: citizens from High Migratory Pressure Countries residents in Marche; HDC: citizens from Highly Developed Countries residents in Marche.*

In the multiple Poisson regression analysis (Table 1), a mean annual decrease of 4% in hospital admissions was estimated for the overall resident population of the Marche Region. Compared with Ita-Marche residents, hospitalization rates were 21.5 and 27.2 admissions per 1,000 py lower among HMPC and HDC residents, respectively. A slight difference of 3 admissions per 1000 py was detected between sexes.

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Table 1. Age-standardized hospital admission rate trends adjusted for citizenship and sex, Marche Region, 2011-2023. Results from the multiple Poisson regression model

	MPC (95% CI)
Calendar year	-4.01 (-4.02; -4.01)
Population groups	
Ita-Marche	1.0
HMPC	-21.53 (-21.55; -21.51)
HDC	-27.18 (-27.20; -27.16)
Sex	
Female	1.0
Male	-3.31 (-3.34; -3.29)

MPC: Mean percentage changes; 95%CI: 95% Confidence Interval; Ita-Marche: Italian citizenship residents in Marche; HMPC: citizens from High Migratory Pressure Countries residents in Marche; HDC: citizens from Highly Developed Countries residents in Marche.

Avoidable hospitalizations

The overall age-standardized rates of avoidable hospitalizations in Marche region were 10.9 and 6.2 per 1000 py in 2011-2019 and 2020-2023 respectively.

The avoidable hospitalizations showed a marked decline from the pre-pandemic (2011-2019) to the post-pandemic (2020-2023) periods across all population groups (Table S2). Among Ita-Marche and HMPC residents, rates decreased in females and in males when comparing the pre-pandemic and post-pandemic periods; HDC residents showed more variable estimates due to smaller population sizes but followed the same overall decreasing trend. Across all population groups, avoidable hospitalizations were consistently higher in males than in females.

The Poisson regression analysis confirmed these findings, indicating a 42.3% reduction in avoidable hospitalization rates during 2020-2023 compared to the pre-pandemic period. Compared to Ita-Marche residents, rates were 11.3% and 6.1% lower among HMPC and HDC residents, respectively. Males exhibited 43.4% higher rates of avoidable hospitalization compared to females (Table 2).

Cause-specific hospital admissions

The cause-specific hospital admission rates declined for nearly all Major Diagnostic Categories and across all population groups (Supplementary Material Table S2). The highest rates in both periods were observed for neoplasms, diseases of the circulatory system, and diseases of the digestive and genitourinary systems. For these causes, rates decreased markedly over time, particularly among Ita-Marche residents (e.g., circulatory diseases from 16.5 to 9.2 per 1,000 py in females and from 29.2 to 18.7 in males).

HMPC residents showed lower cause-specific hospital admission rates than Ita-Marche for most disease categories, with the exception in females for conditions related to pregnancy, childbirth, and the

Table 2. Age-standardized avoidable hospitalization rates and mean percentage changes (MPC) by period, population groups, and sex in Marche Region. Results of the multiple Poisson regression model

	Age-standardised hospital admission rates per 1,000 py	MPC (95% CI)
Period		
2011-19	10.9 (10.4 - 11.5)	1.0
2020-23	6.2 (5.9 - 6.7)	-42.3 (-42.3; -42.3)
Population groups		
Ita-Marche	10.2 (10.1 - 10.2)	1.0
HMPC	9.0 (8.7 - 9.4)	-11.3 (-11.3; -11.2)
HDC	10.1 (8.9 - 11.5)	-6.1 (-6.1; -6.1)
Sex		
Female	7.9 (7.5 - 8.4)	1.0
Male	11.5 (10.9 - 12.2)	43.4 (43.3; 43.4)

MPC: Mean percentage changes; 95%CI: 95% Confidecen Interval; r.c.: reference category; Ita-Marche: Italian citizenship residents in Marche; HMPC: citizens from High Migratory Pressure Countries residents in Marche; HDC: citizens from Highly Developed Countries residents in Marche.

puerperium, where rates were substantially higher (from 41.9 to 52.5 per 1,000 py in HMPC women versus 19.4 to 16.5 in Ita-Marche women). HDC residents presented intermediate or slightly lower rates than Ita-Marche for most conditions but displayed greater variability due to smaller population sizes.

Across all groups, males had higher hospitalization rates than females, especially for circulatory, respiratory, digestive, and injury-related causes. Women had higher rates for hospitalizations linked to genitourinary diseases.

The Poisson regression analyses (Supplementary Material Table S3) showed significant reductions during the post-pandemic period for most of the conditions and in certain cases the reduction was about 30%. An increase of about 29% was observed in "Certain Conditions Originating in the Perinatal Period" and a substantial stability in "Mental Disorders" with a 0.7% annual change.

Compared with Ita-Marche residents, HMPC residents had lower hospitalization rates in most of the considered conditions, in particular for non-communicable and chronic diseases such as neoplasms (-37.9%), circulatory (-26.8%), respiratory (-25.8%), and musculoskeletal conditions (-45.8%). Female HMPC migrants had higher rates for pregnancy-related and perinatal conditions with rates more than doubling than Ita-Marche females. Men had higher rates for circulatory (+77.6%), respiratory (+56.2%), and injury-related admissions (+22.8%), and lower rates for genitourinary diseases (-18.2%) and musculoskeletal conditions (-18.2%).

Use of hospitalization

Table 3 reports the results obtained applying the two-step models. According to the first part of the analysis (logistic regression model), both migrant populations had lower probability of being hospitalized by 21% and 47% for HMPC and HDC respectively. The probability of being hospitalized also declined during the pandemic period by 24% relative to 2011-2019. As expected, the highest probability of hospital admission was observed in the oldest age group.

In the second step (Poisson regression model), which included only individuals with at least one hospitalization, HMPC and HDC groups had higher hospital utilization rates than Ita-Marche (RR = 1.10 and 1.04, respectively). Hospital use was less frequent during the COVID-19 pandemic (RR = 0.96), more frequent among males (RR = 1.04) and older individuals (RR = 1.09 in ≥65 years).

Table 3. Two-step models to assess the use of hospitalization: all-cause hospitalization probability (logistic model) and frequency of hospitalizations (Poisson model)

	Logistic regression			**Poisson regression**		
	OR	95% CI	p	RR	95% CI	p
Period						
2020-23 vs. 2011-2019	0.76	(0.75; 0.76)	<0.001	0.96	(0.96; 0.96)	<0.001
Population groups						
HMPC vs Ita-Marche	0.79	(0.78; 0.79)	<0.001	1.10	(1.09; 1.10)	<0.001
HDC vs Ita-Marche	0.53	(0.51; 0.56)	<0.001	1.04	(1.01; 1.07)	0.002
Sex						
Male vs Female	0.91	(0.91; 0.91)	<0.001	1.04	(1.04; 1.04)	<0.001
Age groups						
19-44 vs 0-18	0.82	(0.81; 0.83)	<0.001	0.80	(0.79; 0.80)	<0.001
45-64 vs 0-18	0.87	(0.86; 0.88)	<0.001	0.90	(0.90; 0.91)	<0.001
≥65 vs 0-18	2.61	(2.59; 2.62)	<0.001	1.09	(1.08; 1.09)	<0.001

OR: Odds Ratio; RR: Rate Ratio; 95%CI: 95% Confidence Interval; Ita-Marche: Italian citizenship residents in Marche; HMPC: citizens from High Migratory Pressure Countries residents in Marche; HDC: citizens from Highly Developed Countries residents in Marche.

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DISCUSSION

This population-based study analysed hospital admissions in the Marche Region over a 13-year period, comparing Migrant and Italian residents using Healthcare Utilisation Databases. The magnitude of hospital admissions was consistent with national estimates reported by the Ministry of Health, as was the pattern in rates over time [19].

During the study period, hospital admissions for all causes were lower in both migrant populations than in the Italian one, and this difference cannot be explained simply by the diverse age structures of the populations. Firstly, because age-standardised hospitalisation rates were used to compare hospital care utilization across the three populations; secondly, because although individuals from HMPCs were younger than Italians, the HDC group had a comparable mean age. This gap in hospital care use has already been reported in other Italian studies [5, 7] and can be attributed to multiple interacting factors, including the well-documented phenomenon of healthy migrants and social, linguistic, and cultural barriers that can limit access to healthcare services, including primary and preventive care.

Our results also showed a downward trend in hospital admissions over time in all three populations, which was more pronounced in the HDC group for both sexes. The mean annual percentage decrease was similar among HMPC and Italian residents, with larger declines observed in males than in females. In fact, this trend reflects the overall Italian and European picture, where reductions in hospital admissions have been reported between 2000 and 2017 [20]. These declines have occurred alongside a reduction in hospital beds per capita and a slight increase in the average length of stay, in line with policies aimed at improving the appropriateness of hospital care and reserving admissions for more serious health conditions [19, 20].

The reduction in hospitalisations saw a sharp decline in 2020, coinciding with the COVID-19 pandemic, reaching the lowest level ever recorded in the study period in all three populations. The pandemic had a uniform impact on hospital use regardless of citizenship, whereas the post-pandemic period appears to be evolving differently among the three populations.

Another important finding emerged from our study. Migrants showed a dual profile: they were less likely to be admitted to hospital, yet those who were hospitalized at least once used hospital services more frequently. Worse health conditions at the time of admission, which may result in repeated hospitalisations, could explain this higher frequency of use. Indeed, our study did not reveal specific conditions for which migrants were admitted more often than Italians, with the exception of conditions related to childbirth. This dual pattern is consistent with findings from an Austrian study [21], according to which migrants reported higher readmission rates despite lower overall hospitalisation rates. The authors suggest that lower hospitalisation rates may reflect barriers to timely and appropriate access to healthcare rather than better underlying health, and that higher readmission rates may indicate more advanced disease severity at first hospital contact or missed opportunities for early intervention. Furthermore, a similar duality has been documented in an Italian study on emergency department utilisation [14], supporting the hypothesis that emergency room contacts may, in some cases, evolve into subsequent hospitalisation.

Further relevant results from our study concerns avoidable hospitalizations and cause-specific admissions, which deepen the understanding of differences in hospital care utilization between migrants and Italian residents in Marche Region.

Rates of avoidable hospitalizations declined markedly during the pandemic period in all citizenship groups and, in addition, both migrant groups had lower avoidable hospital admissions than Italians, whereas males had higher rates than females. These findings should be interpreted with caution, as administrative data do not allow us to distinguish whether the lower avoidable hospitalizations of migrants reflect better health or an unmet need that emerges in later stages of the disease. Other Italian studies reported higher odds [4] and higher rates [22] of avoidable hospitalizations for migrants than Italians, however, these discrepancies depend on population definitions, age restrictions and study design. Our study includes the entire resident population, without age restrictions and excluding undocumented individuals by design.

Strengths and limitations

Our study based on healthcare utilization databases used the citizenship field in the Regional Beneficiaries Database to distinguish between Italian and migrant residents. This proved to be more effective than the one based on country of birth in identifying migrant status [15], but it did not allow for the individual level of social integration in the host country to be taken into account, nor did it detect factors related to the use or misuse of hospital admissions, such as socioeconomic status, linguistic level, or health literacy. Furthermore, it was not possible to consider the impact of the length of stay in Italy, which can only be deduced from administrative databases in a very approximate manner. Moreover, the COVID-19 pandemic introduced sharp changes in hospital utilisation that may have differentially affected the populations groups in ways not fully captured by our models.

One of the strengths of this study is that it is based on a large population-wide cohort that included all residents of the Marche Region over a long period of 13 years. The use of hospital discharge databases allowed for a comprehensive and systematic consideration of hospital admissions over time. In addition, the analysis of avoidable and cause-specific hospitalizations provides a more granular understanding of healthcare utilization patterns beyond overall admission rates.

CONCLUSIONS

In conclusion, this study highlighted differences in hospital admission rates based on nationality and different attitudes towards hospital care. In this regional context, migrants are younger and apparently healthier than their Italian counterparts, but with a higher frequency of readmissions. This study is unable to assess whether these differences are actually disparities, but it does show possible critical issues in public health, suggesting the need for targeted intervention in favour of potentially vulnerable populations.

AUTHORS' CONTRIBUTIONS

RG and MI conceptualized the study, developed the methodology for data analysis and drafted the manuscript. MI managed the data and performed the formal statistical analyses. MP and FC were in charge for data extraction and authorized their utilization. RG, MI, AF, ES assisted in the results interpretation. All authors assisted in manuscript revision, read and approved the final manuscript. RG is the guarantor of the overall content of the work.

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CONFLICT OF INTEREST

The authors have declared no conflict of interest.

ETHICS STATEMENT

This observational study fulfils the Italian regulations of ethics committees, which require only standard written informed consent at the time of hospital admission.

Ethical review and approval were waived for this study. We did not mention ethical safeguards simply because not pertinent in our study. All data were anonymized and managed in a manner that protected the privacy and confidentiality of individuals represented in the datasets.

According to Article 9 of the General Data Protection Regulation (European Union Regulation 2016/679), pseudonymized administrative data can be used without specific written informed consent when patient information is collected for healthcare management, quality evaluation, and improvement. All procedures adhered to the 1964 Helsinki Declaration and its subsequent amendments.

DATA AVAILABILITY STATEMENT

Restrictions apply to the availability of these data. The datasets generated and/or analysed during the current study are property of a third party that is the Regional Health Agency of Marche (ARSMarche) and, although they are anonymized, datasets are not publicly available due to the current regulation on privacy. The description of the administrative databases is available from the website ARSMarche/Flussi.

Other researchers can obtain access to the data through a formal request based on a research project to the Regional Health Agency of Marche.

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