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Can Nationwide Central Appointment Systems Reduce Waiting Times in Turkish Public Hospitals?

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ABSTRACT

Health service delivery is an important component of a well-functioning health system. To achieve a competitive healthcare system, healthcare should be provided on time to avoid delays that could harm the patient. In this respect, patient wait time is an important indicator of health services delivery performance. Countries develop national or regional booking systems to manage patient wait times and healthcare delivery resources more efficiently. In this study, the effect of a national booking system on outpatient waiting times in Turkish public healthcare settings was investigated. This study was conducted using anonymized national outpatient data sets for the year 2016 with permission from the Republic of Türkiye Ministry of Health. The data was analyzed after pre-processing and transformation. As a result of the study, patient wait times were calculated, analyzed and evaluated according to province and facility care levels (secondary or tertiary). Results showed that in 2016, only 30.69% of outpatient visits had appointments and that the average waiting time for patients with appointments was 11.18% shorter than for patients without ap-

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pointments. The results of this study fill a gap in the literature, as almost no studies have investigated this issue due to a lack of administrative and clinical data and will provide important evidence for the improvement of health service delivery systems.

Keywords: Appointment System, Healthcare Management, Health Systems, Health Informatics, Patient Wait Time

BACKGROUND

The World Health Organization states that health service delivery is an important component of a well-functioning health system (World Health Organization, 2010) and defines patient-centered care as "a tool to improve services related to access, quality, user satisfaction, and efficiency" (Gröne & Garcia-Barbero, 2001). Mature service delivery systems respect patients' values, preferences, and expressed needs and feature coordination and maintenance integration (Lewis, 2009). The evaluation of health service delivery is directly related to patient satisfaction of health services and this is reflected in service quality outcomes (Bleustein et al., 2014; Gunal & Pidd, 2008). An increase in patient waiting times in outpatient clinics is a driver of decreased patient satisfaction (Siciliani et al., 2014). The US Institute of Medicine states that there are six guiding principles for achieving a more competitive healthcare delivery system. One of these principles is the ability to provide timely health care and reduce delays that can result in patient harm (Corrigan, 2005). In this respect, patient waiting time is a key measurement of a healthcare system's ability to meet expectations. However, it is clear that accessing health services currently involves unacceptable wait times and that time wastage in service delivery is a global problem (Buckle & Stuart, 1996; Hong et al., 2013).

Access to health services is defined as the degree to which individuals are able to enter the health system and receive care (Canadian Institute for Health Information, 2012). Although there are many factors affecting service access, perhaps the most important factor from the patient's point of view is how long they must wait for the service they need (Statistics Canada, 2005). It is not surprising that access problems have negative consequences for patient health, such as prolonged wait times and delays in diagnosis, treatment, or follow-up. In conclusion, studies in the literature suggest that reducing patient wait times

is a priority for health systems (British Columbia Medical Association, 2006; Cook et al., 2006; Kielar et al., 2010; Schwartz et al., 2004; Speed et al., 2016)

Although prolonged wait times are an important problem affecting the quality of healthcare services, access to data in this area is very limited. As a result, there is a significant deficiency in evaluations of the prevalence and effects of this problem in terms of internationally accepted standards in research (Brandenburg et al., 2015; Leddy et al., 2003; Michael et al., 2013). Given the evidence that poorly designed systems lead to significant loss of time and resources, analyzing wait times is a good starting point for redesigning system accessibility (Kreindler, 2010).

Studies in the literature show that unnecessarily complicated appointment processes, unnecessary steps, probable system delays, in-hospital traffic jams, and insufficient use of human or physical resources contribute to long queues in healthcare services even in cases where capacity is sufficient to respond to demand (Kreindler, 2008). The complexity of the patient's route within the healthcare institution causes managerial difficulties, and this complexity means management needs evidence-based information to develop solutions. At this point, examining patient flow and monitoring waiting points can provide the evidence-based information that managers need to improve the situation. Some recent studies have shown that by analyzing patient flow routes, data can be used to better allocate resources and plan schedules, thus increasing productivity through informed decision making (Hong et al., 2013; Santibáñez et al., 2009; Sun et al., 2017; White et al., 2011). Thanks to this information, patient routes can be changed, staff distribution can be arranged, and management can be made more effective by developing a planning model for each process or by searching for alternative solutions (Hong et al., 2013).

Healthcare information systems are the most important data source for creating evidence-based information to improve the quality of healthcare services. This technology makes it possible to monitor patient care through the healthcare information system and to understand service expectations of patients, service supply capacities of healthcare facilities, and possible bottlenecks that may occur in the patient's route within facilities. In other words, real-time service delivery data is an extremely convenient material for evidence-based research (Devaraj et al., 2013; Institute of Medicine, 2015; Siciliani & Hurst, 2005).

As can be understood from the explanations above, in-hospital patient waiting time is an important factor affecting patient satisfaction, the performance of the healthcare system, and clinical outcomes. The main objective of this research paper was to understand the impact of the national appointment system (CPAS) used in Türkiye on outpatient wait times. This was obtained by looking at one-year data in the appointment system for public secondary and tertiary healthcare facilities in each of the 26 geographic regions identified as NUTS-2 regions. In this way, the impact of the national appointment system on patient wait time was analyzed and opportunities for improvement were identified.

A study analyzing wait times using appointment system data was conducted in Türkiye limited only to three hospitals (Küçük et al., 2021). The use of national appointment system (Central Physician Appointment System-CPAS) in Türkiye over the years and the problems conveyed to the ministry within the CPAS have been discussed in this study. However, since the data on waiting times are limited to only three hospitals, the relevant study findings cannot be generalized across Türkiye. No other study was found in the sample of Türkiye that revealed the general situation.

Confusion in the Literature

Different measures are seen in the literature to examine the concept of time in health service delivery. One of these measures is "flow time" which is the total time a patient spends in the hospital and includes both waiting and service durations (Cayirli & Veral, 2003). A second measure commonly found in the literature, "waiting time" is used, which is defined as the time between when the patient requests the service (i.e. makes the appointment) and when the service is actually received (Leddy et al., 2003). A third commonly used measure, and the measure used in this study, is "patient waiting time" which measures the time a patient waits in the clinic before being seen by the clinical staff.

Türkiye National Appointment System

The National Healthcare Information Systems (NHIS) is a functional database that is available to all citizens without any discrimination. Citizens can access their health records online through the NHIS, which collects and stores real-time healthcare utilization data from birth to death (TC Ministry of

Health, 2019). The NHIS was launched in Türkiye in 2002 as one of the main components of a comprehensive national healthcare transformation program.

With the nationwide implementation of the NHIS, standardized and accurate health information was made readily available to healthcare managers to support decision making.

The Turkish NHIS is integrated with a national Centralized Physician Appointment System (CPAS). Turkish citizens can obtain appointments for physicians of their choosing at any of the Ministry of Health hospitals, oral and dental health centers, or family physician offices. Citizens access the system by calling a national free hotline number for live operator assistance, by accessing the system's website, or by using the CPAS mobile applications (Yıldızbaşı et al., 2016) (Figure 1). All appointments are registered with CPAS. As a health-related services, CPAS can be counted as one of the 20 basic public services accepted by the European Union (Budinoski & Trajkovik, 2012). The CPAS gathered scattered appointment systems in public hospitals and health institutions into a single centralized system and claims to be the first and only system in the world to do so (TR Ministry of Health, 2020). According to the Ministry of Health 2016 data, the CPAS's accessibility rate by citizens through the call center, internet and mobile applications is 99.6% (TR Ministry of Health, 2020). Data collected from the CPAS appointment system is used to inform and develop new health policies (Bucak et al., 2018; Kurşun & Kaygısız, 2018).

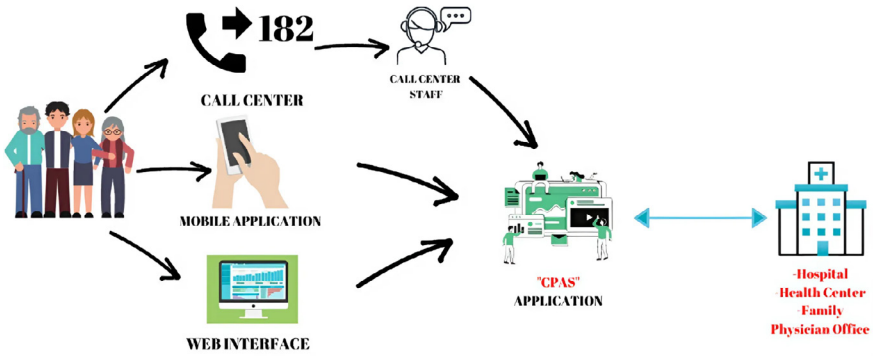

Figure 1. CPAS system overview

METHODS

Sample Selection

The scope of this study includes 2016 outpatient data sets from public secondary and tertiary level hospitals owned and managed by the Republic of Türkiye Ministry of Health. The sample selection was determined using the European Union's Nomenclature of Territorial Units for Statistics (NUTS). The NUTS 2 region provinces have been grouped together because they have common problems, are socioeconomically and culturally close to one other, and are geographically similar (Cheshire et al., 2011). The characteristics of populations in this group offer opportunities for comparison that can be used to explore practices and policies of the region (Eurostat, 2020). In this study, public secondary and tertiary level hospitals in the central province of the 26 geographical borders in the NUTS-2 region are discussed (Figure 2).

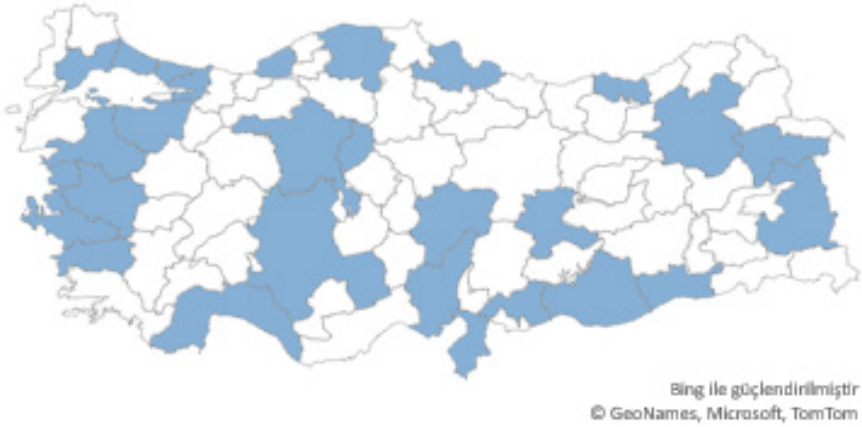

Figure 2. NUTS 2 regions in the central province of Türkiye
(Regions in blue indicate NUTS-2 regions.)

Data Collection and Pre-processing for Analysis

With permission from the Ministry of Health, access to anonymized data sets from the national appointment system (CPAS) for the year 2016 was obtained after submission of all required legal and ethical documentation. The study was conducted within the framework of the Ministry of Health's ethical guidelines. The study is a quantitative, retrospective, and cross-sectional study in which the waiting times of patients receiving outpatient treatment at public secondary and tertiary healthcare facilities in 2016 were analyzed. The data sets obtained are grouped as seen in Figure 3.

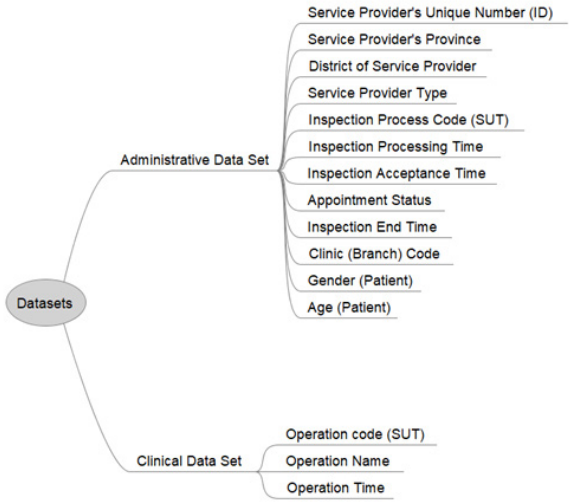

Figure 3. Data sets to be used in the analysis

In the data pre-processing phase, collected data were cleaned according to data types (nominal, sequential, continuous, range, etc.). During the cleaning phase, the status of missing, noisy, or inconsistent data was evaluated and assessed for data quality according to criteria such as validity, completeness, consistency, uniformity, density uniqueness, accuracy, integrity, etc. (Oğuzlar, 2003; Pyle, 1999). Records that were not suitable for analysis according to these criteria were excluded (Table 1).

To calculate the patient wait time (the time between patient registration and the beginning of the examination), records were selected by filtering for national medical service codes associated with "Normal Outpatient Examination". Next, any of the data elements in the data set that are essential in calculating the waiting time such as "Examination Process Time", "Examination Acceptance Time", "Examination End Time" were examined from the data set.

Data were pre-processed, analyzed and visualized with QlikView, a business intelligence tool (García & Harmsen, 2012), that was installed on a server allocated by the Ministry of Health. The data was not physically exported from that server, even after anonymization.

Data Exclusions and Cleaning Criteria

Public secondary and tertiary level hospitals with fewer than 4,000 outpatient admissions, fewer than 100 inpatient admissions per month, and hospitals that had opened for the first time in 2016 were excluded from the analysis. Emergency room examinations were also excluded from the analysis. Additionally, patient level records that indicate a patient wait time of less than or equal to zero minutes were excluded from the study due to data inconsistency. After the data exclusion processes described here, 65,893.517 anonymous data remained for analysis. Data cleaning operations continued using this anonymous data set.

In order to prepare the data for calculation, records with a "Processing Time and Appointment Time" between 09:00 and 16:00 on weekdays were included according to defined normal working hours for each facility, and any records that took place outside of these parameters were excluded from analysis. It was determined that some patient records had birth date information in the "age" field, so values for "age" that were outside the range of 0-116 years of age were excluded from the operations data set. In the transaction records in the data set, it was determined that two different Clinical Codes (147 and 197015) were used for the branch of General Surgery in the Clinical Code data field. These two types of records were merged into one category to prepare the data for analysis. The number of transactional data that remained for analysis after applying exclusions and cleaning the anonymous data made available by the Ministry of Health are presented in Table 1.

Table 1: The number of data remaining for analysis after data exclusion and cleaning operations

"Data Exclusion" and "Data Cleaning" process	Number of Remaining Data
Exclusion of records for transactions taking place outside of normal working days.	65,893.517
Exclusion of records for transactions taking place outside of normal working hours.	65,116.946
Exclusion of patients with ages outside the established range of 0 to 116 years.	50,404.785
Merging of two general surgery clinical codes	50,279.512

Calculation of Appointment Rate and Patient Wait Time

To calculate the appointment rate and the patient wait time, the following fields and time formats from the data set were used:

Appointment Time refers to the planned start time of the appointment that the patient was given on the CPAS. Some records indicate that no appointment was given on CPAS, but contained data in the "Appointment Time" field because the appointment was made by the hospital on the same day of the service.

Registration Time refers to the actual time that the patient completes registration at the front desk upon arriving at the facility for their appointment. During registration, the type of service and department are recorded in the patient's record. For services other than physician visits (such as diagnostic imaging tests), the data in this field represents the time that the doctor requested/ scheduled the relevant transaction.

Physician Visit Start Time refers to the actual time that the patient is invited into the doctor's examination room, the actual time that the service begins, or the actual time that visit data is recorded on the Healthcare Information Management System.

The patient wait time is calculated as shown in the equation.

***Patient Waiting Time (min)*= Physician Visit Start Time-Registration Time**

Patient Waiting Time Equation

RESULTS

According to the analysis of the data for the 50,279.512 outpatient visits that remained after exclusion and cleaning procedures, 34,850.012 (69.31%) of the total visits were made without appointments. When the data set is looked at according to patient gender, 39% of visits were for male patients (19,389.902) and 61% were for female patients (30,889.610). Of the 30,69% of all patients that had appointments, 63.2% were female and 36.8% were male. Of all female patients in the data set, 32% made appointments. Of all male patients in the data set, 29% made appointments. Appointment rates by patient gender are shown in Table 2.

Table 2: Analysis of appointment rate by patient gender

Appointment Status	Number of Outpatient Physician Visits	% of Total	Patient Gender	Number of Visits by Patient Gender	% by Appointment Status and Patient Gender
With appointment	15,429.500	30.69%	Male	5,671.888	36.8%
			Female	9,757.612	63.2%
Without appointment	34,850.012	69.31%	Male	13,718.014	39.4%
			Female	21,131.998	60.6%
Total	50,279.512	100%	Male	19,389.902	38.6%
			Female	30,889.610	61.4%

Appointment Rates According to Facility Type

When the facility level of care is considered, 64.08% of all outpatient visits in the data set were performed at secondary care facilities and 35.92% were provided at tertiary care facilities. Appointment rates for outpatient visits were 29% at secondary care hospitals and 34% at tertiary care hospitals. Conversely, 71% of secondary and 66% of tertiary care hospital visits did not have appointments. As can be seen, the rate of visits without appointments is higher than those with appointments at both secondary and tertiary care facilities (Table 3).

Table 3: Appointment status according to facility care level

Facility Care Level	Appointment Status	Number of Visits	% by Facility Care Level and Appointment Status
Secondary	With appointment	9,341.697	29%
	Without appointment	22,877.015	71%
	Total	**32,218.712**	**64.08%**
Tertiary	With appointment	6,087.803	34%
	Without appointment	11,972.997	66%
	Total	**18,060.800**	**35.92%**
All Facilities		**50,279.512**	**100%**

Patient Wait Times According to Facility Care Level and Appointment Status

Patients with appointments waited for an average of 108.3 minutes in secondary care facilities, while patients without appointments waited an average of 128.1 minutes. In tertiary care facilities, patients with appointments waited an average of 61.4 minutes, while patients without appointments waited an average of 48.8 minutes. In secondary care facilities, patients with appointments on average waited 15.46% less than patients without appointments. In tertiary care hospitals, patients without appointments on average waited 25.82% less than patients with appointments (Table 4).

Table 4: Patient wait times according to appointment status and facility care level

Facility Care Level	Appointment Status	Average Wait Time (min)	Decrease Percentage in Waiting Time	% Rates
Secondary	With appointment	108.3	15.46%	29%
	Without appointment	128.1		71%
				64.08%
Tertiary	With appointment	61.4	(-) 25.82%	34%
	Without appointment	48.8		66%
				35.92%
All	**Average**	**98.3**		**100.0%**

When the average patient wait time for examinations at both secondary and tertiary level health institutions are analyzed, the average waiting time of all patients is 98.3 minutes (Table 4) of patients with appointments is 89.8 minutes, and of patients without appointments is 101.1 minutes.

Distribution of Outpatient Visits by Appointment Status, Facility Care Level, and Province

The number of outpatient visits in the data set with and without appointments according to province and facility care level is presented in Table 5. In terms of total number of visits, Istanbul, Ankara and Izmir were the top three largest provinces making up 47.1% of examinations in all provinces. These are also the three most populous regions in Türkiye. Istanbul, the largest province in terms of population and outpatient visit numbers, had an appointment rate of 32.0%. Ankara, the second largest province, had an appointment rate of 38.0%. İzmir, Türkiye's third largest province, had an appointment rate of 20.2%. Sanliurfa province showed the highest appointment rate at 62.4%, while Kastamonu had the lowest at 1.6%.

For secondary care facilities, Istanbul, Izmir, and Ankara had the highest number of outpatient visits in the data set. The secondary care facility appointment rate for Istanbul was 27.8%, for Izmir was 18.2%, and for Ankara was 44.2%. Sanliurfa had the highest appointment rate among secondary care facility visits in all provinces at 62.3%, while Kayseri had the lowest appointment rate at 5.7%.

For tertiary care facilities, Istanbul, Ankara, and Izmir had the highest numbers of outpatient visits respectively. The tertiary care facility appointment rate for Istanbul was 35.9%, for Ankara was 32.7%, and for Izmir was 23.6%. Malatya had the highest appointment rate (63.1%) among tertiary care facilities in all provinces. Erzurum had the lowest appointment rate at 8.5%. There are no tertiary care facilities in three of the provinces as shown in Table 5.

Table 5: Distribution of examinations by appointment status, facility care level, and province

Province	Secondary Care Facility		Tertiary Care Facility ** Province has no tertiary facility*		All Facilities	
	With appointments	Without appointments	With appointments	Without appointments	With appointments	Without appointments
ADANA	367,008	1,219.399	166,794	625,183	533,802	1,844.582
AGRI	34,455	216,102	*	*	34,455	216,102
ANKARA	1,059.553	1,338.086	920,762	1,891.180	1,980.315	3,229.266
ANTALYA	456,906	821,209	22,906	235,668	479,812	1,056.877
AYDIN	178,195	666,206	12,148	34,011	190,343	700,217
BALIKESIR	295,842	1,062.549	7,561	23,244	303,403	1,085.793
BURSA	888,794	846,217	303,890	217,483	1,192.684	1,063.700
ERZURUM	20,037	274,253	17,167	185,516	37,204	459,769
GAZIANTEP	152,280	987,785	52,814	519,862	205,094	1,507.647
HATAY	912,435	643,571	14,293	12,968	926,728	656,539
ISTANBUL	1,791.024	4,659.130	2,534.577	4,525.280	4,325.601	9,184.410
IZMIR	560,242	2,520.575	436,918	1,416.528	997,160	3,937.103
KASTAMONU	22,043	146,015	3,237	11,263	25,280	157,278
KAYSERI	15,571	259,866	175,919	480,307	191,490	740,173
KIRIKKALE	30,397	138,248	*	*	30,397	138,248
KOCAELI	346,237	1,193.835	138,206	286,203	484,443	1,480.038
KONYA	299,454	1,350.834	33,318	243,985	332,772	1,594.819
MALATYA	89,843	214,017	450,905	263,175	540,748	477,192
MANISA	161,281	1,209.198	12,400	37,843	173,681	1,247.041
MARDIN	39,703	157,904	7,804	7,230	47,507	165,134
SAMSUN	405,907	538,713	334,388	221,074	740,295	759,787
SANLIURFA	737,280	445,852	306,690	182,199	1,043.970	628,051
TEKIRDAG	225,003	713,590	*	*	225,003	713,590
TRABZON	80,005	330,733	28,149	196,879	108,154	527,612
VAN	46,483	273,702	93,735	307,065	140,218	580,767
ZONGULDAK	125,719	649,426	13,222	48,851	138,941	698,277

Patient Wait Times by Appointment Status, Facility Care Level, and Province

The average patient wait times and standard deviations for outpatient visits by province are shown in Table 6.

Table 6: Average patient wait times in minutes by appointment status, facility care level, and region

Province	Secondary Care Facility				Tertiary Care Facility ** Province has no tertiary facility*				All Facilities			
	With appointments		Without appointments		With appointments		Without appointments		With appointments		Without appointments	
	Avg. Pt. Wait Time	Standard Deviation	Avg. Pt. Wait Time	Standard Deviation	Avg. Pt. Wait Time	Standard Deviation	Avg. Pt. Wait Time	Standard Deviation	Avg. Pt. Wait Time	Standard Deviation	Avg. Pt. Wait Time	Standard Deviation
ADANA	22.8	449.3	5.1	223.2	0.9	5.7	2	122.7	16.2	375.4	4.1	195.2
AGRI	7.1	29.5	1.8	71.8	*	*	*	*	7.1	29.5	1.8	71.8
ANKARA	211.3	2063.9	99.7	1550.5	29.5	55.1	55.1	1356.7	127	1514.5	72.9	1437.4
ANTALYA	50.9	1286.5	34.4	635.9	108.5	139.5	44.4	145.2	53.6	1257	36.9	557.1
AYDIN	20.2	208.4	41.9	521.2	14.9	10.7	15.9	11.7	19.9	201.7	40.5	506.8
BALIKESIR	57.1	1752.6	43.9	721.4	34.8	33.1	38.7	103.6	56.6	1730.6	43.8	714
BURSA	213.7	7052.3	77.6	2718.3	72.9	1725.8	112	2469.8	178	6155.6	84.1	2672.9
ERZURUM	27	138.5	32	872.9	7.3	19.4	8	121.4	17.4	100.7	21.4	656.5
GAZIANTEP	14.8	652	73.7	2689.3	2.7	92	2.3	85.9	11.7	563.8	48.7	2170.2
HATAY	27.4	40.5	26.8	40.5	46.4	67.6	50.5	69.4	27.7	41.1	27.3	41.3
ISTANBUL	247.8	4303.7	531.2	10827.8	109	5538.5	60.2	1829.8	166.7	5062.8	297.2	7791.4
IZMIR	17.1	168.7	13.1	246.9	15.2	11.3	30.8	951.2	16.2	126.6	19.7	612.4
KASTAMONU	58.2	81.2	48.5	840.4	36.7	79.9	36.8	47.8	55.4	81.4	47.7	813.3
KAYSERI	30.9	53.2	26.7	650.4	7.5	230.3	177.2	1853.9	9.4	221.4	122.6	1532.4
KIRIKKALE	30	60.5	36.6	107.5	*	*	*	*	30	60.5	36.6	107.5
KOCAELI	7.2	124.5	5.5	156.1	2.8	9.1	2.9	17.5	6	105.4	5	141.4
KONYA	34.3	666.6	28.9	882.1	18.4	105.7	55.8	845.9	32.7	633.7	33	876.8
MALATYA	30.6	51.4	45.5	1117.5	30.1	40.5	31.1	35.6	30.2	42.5	38.8	814.8
MANISA	9.2	204.5	29.9	477	0.9	0.6	0.4	1	8.6	197.1	28.9	468.7
MARDIN	38.7	128.6	195.6	1785.6	87.8	1150.9	90.7	1310.3	46.8	481.4	191.7	1770.3
SAMSUN	24.8	217.8	45.9	752.9	25	46.6	29.3	50.6	24.9	164.4	41.7	652.7
SANLIURFA	29.8	46.8	51.3	612.6	*	*	*	*	31.6	45.8	46.8	512.1
TEKIRDAG	32.8	251	57.6	954.7	35.7	43.4	36.4	44.5	32.8	251	57.6	954.7
TRABZON	13.9	323.9	13.5	202	85.2	2491.5	104.5	3940.1	32.5	1303.5	47.4	2410.9
VAN	4	10.6	3.2	137.7	0.6	5.1	4.8	251.7	1.8	7.7	4	203.8
ZONGULDAK	2.6	143.2	3.2	90.2	5.5	7	5.1	8.6	2.8	136.3	3.3	87

As shown in Table 6, average patient wait times for patients with appointments in secondary care facilities reveals that the five provinces with the longest patient wait times are in Istanbul, Bursa, Ankara, Kastamonu, and Balikesir (247.8, 213.7, 211.3, 58.2, and 57.1 minutes, respectively). For those without appointments in secondary care facilities, the longest average patient wait times are in Istanbul, Mardin, Ankara, Bursa, and Gaziantep (531.2, 195.6, 99.7, 77.6, and 73.7 minutes, respectively). Istanbul has the longest wait time for outpatient visits with and without appointments at secondary care facilities.

For tertiary care facilities, the five provinces with the longest average wait times for patients with appointments are Istanbul, Antalya, Mardin, Trabzon, and Bursa (109, 108.5, 87.8, 85.2, and 72.9 minutes, respectively). For those without appointments, the longest average patient wait times are in Kayseri, Bursa, Trabzon, Mardin, and Istanbul (177.2, 112, 104.5, 90.7, and 60.2 minutes, respectively). Istanbul has the longest average wait times in tertiary care hospitals for patients with appointments, while Kayseri has the longest average wait times for those without appointments.

An analysis of all facilities shows that the five provinces with the longest average wait times for patients with appointments are Bursa, Istanbul, Ankara, Balıkesir, and Kastamonu, (178, 166.7, 127, 56.6, and 55.4 minutes, respectively). The longest average wait times for patients without appointments are in Istanbul, Mardin, Kayseri, Bursa, and Ankara (297.2, 191.7, 122.6, 84.1, and 72.9 minutes, respectively). This analysis reveals that the province of Istanbul is the province with the highest waiting time for patients with and without appointments for outpatient visits.

DISCUSSION

Healthcare information systems are a key tool for evidence-based efforts to increase healthcare service. Many studies in the literature are based on questionnaires, direct observations, or retrospective calculations of patient wait times (Johnson & Rosenfeld, 1968; Kreindler, 2010; Mardiah & Basri, 2013; Pierce et al., 1990; Schoen & Doty, 2004; Siciliani et al., 2014). According to a study published in 2017, studies on patient wait times that are based on administrative records of health service delivered in a hospital setting are rare (Sun et al., 2017). Many studies in the literature have demonstrated that es-

tablishing a process improvement team to evaluate and redesign patient care processes in any healthcare facility can be a successful approach to reducing patient wait times (Adamu & Oche, 2014; Pierce et al., 1990). Similarly, methods developed in the fields of operations research and systems engineering have provided significant improvements in hospitals and clinics in terms of cost, efficiency, and patient satisfaction (Litvak & Fineberg, 2013; Rohleder et al., 2013). However, these efforts are still in development and are relatively few in number (Watts et al., 2013).

Published studies on the Turkish national appointment system have covered such topics as the attitudes and awareness of patients and physicians towards the CPAS application; the effectiveness of the application; the effects of the application on patient and physician satisfaction; the effect of wait times on patients, and problems encountered in practice (Şahin, 2013). With increasing popularity since the 2000s, studies have also utilized lean hospital methods and lean transformation activities to increase efficiency in hospitals (Özdemir, 2013) and have shown that lean hospital studies have contributed positively to shortening patient wait times. However, these studies were also focused on a single hospital and several processes within that hospital. No comprehensive study was found in the literature that analyzed in-hospital patient wait times for multiple hospitals and provinces based on administrative and clinical data.

According to the findings of our study, of the 50,279.512 normal outpatient visits in the study data set, 30.69% had appointments and 69.31% did not (walk in patients). Although, the CPAS system was launched in 2010, the 2016 data set implies that desired utilization rates have not yet been achieved (Table 2).

When the distribution of all outpatient visits according to patient gender is evaluated (Table 2), it is seen that 38.6% of the patients are male and 61.4% are female. Looking at the distribution of these visits by appointment status (Table 2), 36.8% of visits with appointments are for male patients and 63.2% are for female patients. For visits without appointments, 39.4% are for male and 60.6% are for female patients. As seen in Table 2, 29% of male patients have appointments and 32% of women have appointments. Female patients are seen to have higher appointment rates than male patients.

According to analysis of the appointment status of outpatient visits according to the care level of the facility (Table 3), 64.08% of total visits were carried

out in secondary and 35.92% in tertiary care facilities. According to the results shown in Table 3 data, out of a total of 32,218.712 visits that took place at secondary care facilities, 28.99% were made with appointments and 71.05% were made without appointments. For tertiary care facilities, 33.70% of a total of 18,060.800 visits were made with appointments and 66.29% were made without appointments. According to these results, most patients come to the hospital without appointments at both secondary and tertiary care facilities. Also, while patients with appointments in secondary care facilities wait, on average, 15.46% less than patients without appointments, patients with appointments in tertiary care facilities actually experience 25.82% longer wait times than patients without appointments. It is an unexpected finding that patients with appointments in tertiary care facilities have longer wait times than patients without appointments. Explanation of this finding requires additional research to identify variables that may affect patient wait times, such as clinical department, patient case-mix, patient demographics, or appointment distribution.

According to the average patient wait times for outpatients shown in Table 4, the average wait time for patients with appointments is 89.8 minutes. The average wait time for patients without appointments is 101.1 minutes. Overall, the CPAS has an 11.18% positive effect on average patient wait times. In general, patients with appointments spend less time waiting for normal outpatient visits to begin than those who walk in without appointments in Türkiye. Increasing utilization of the CPAS is expected to have a positive impact on the health care delivery of outpatient services in public hospitals.

When appointment rates are broken down by provinces, as shown in Table 5, outpatient visits without appointments were more common in all provinces except for Bursa, Hatay, Malatya, and Sanliurfa which had appointment rates of over 50%. When secondary and tertiary care facilities are considered separately, appointment rates over 50% for secondary care facilities were seen in Bursa, Hatay, and Sanliurfa and for tertiary care facilities in Bursa, Hatay, Malatya, Mardin, Samsun, and Sanliurfa provinces. These findings indicate that appointment rates are driven more by local dynamics than by general policy. The difficulty of managing such a large number of walk-in patients without appointments and planning in-hospital processes is obvious. Local and centralized efforts to increase appointment rates needed.

As shown in Table 6, average patient wait times for outpatient visits in hospitals in Istanbul, Ankara, Bursa, Balikesir, Kastamonu, Antalya, and Mardin provinces range from 2-3 hours. Conversely, the average patient wait times ranging from 1 to 7 minutes are seen in Adana, Agri, Kocaeli, Van and Zonguldak provinces do not seem reasonable (does not seem to be logical). This may be explained by local practices where appointments are recorded on the CPAS at the time of patient registration in hospitals, which would mean that true pre-examination wait times are not recorded. In general, the high standard deviations of average patient wait times indicate that wait times across hospitals in the province are highly variable. To understand this further, additional studies are needed to identify variables that may affect results of hospitals within the same province.

As shown in Table 6, Bursa province has the longest average patient wait time for patients with appointments (178 ± 6155 minutes) and for patients without appointments (average 297 ± 791 minutes). It is particularly striking that Istanbul has the highest average patient wait time for examinations with and without appointments. This finding could be explained by the number of doctors per capita in Istanbul, however, there are relatively fewer public hospitals in Istanbul in comparison to other provinces and there are more private hospitals in Istanbul which are not included in this study. Additionally, the large population in Istanbul means that a larger number of patients come to hospitals without appointments demanding health services (Turkish Statistical Institute, 2018a; Turkish Statistical Institute, 2018b). All these factors may contribute to the long waiting times in this province.

Average patient wait times in secondary care facilities reflect the results for Türkiye in general. Patients with appointments in secondary care facilities wait for shorter average durations than those without appointments. However, results for 14 provinces were exceptions (Adana, Agri, Ankara, Antalya, Balikesir, Bursa, Hatay, Izmir, Kastamonu, Kayseri, Kocaeli, Konya, Trabzon, and Van) as shown in Table 6. Patients with appointments had longer wait times than patients without appointments in secondary care hospitals in these 14 provinces. Patients without appointments in secondary care facilities waited the longest durations in Istanbul, Mardin, Ankara, Bursa, and Tekirdag, ranging from 1-9 hours. Patients with appointments in secondary care facilities waited

the longest durations in Istanbul, Ankara, and Bursa with average durations of approximately 4 hours.

Similarly, patients without appointments in tertiary care facilities had longer average wait times than patients with appointments as seen in Table 6. Conversely, in Antalya, Gaziantep, Istanbul, Manisa, and Zonguldak provinces, patients with appointments had longer wait times than patients without appointments in tertiary care facilities.

As can be seen in the tables, it is noteworthy that the standard deviations are much higher than the provincial mean values. This indicates that province-based results are not healthy and makes it difficult to conclude that the available data is acceptable for evaluating the performance of the health care delivery system. Just as there is large variation among hospitals within a province, there is also variance among provinces that cannot be attributed to any specific factor. It is reasonable to assume that there are data entry errors in the system, challenges in user-based data classifications in the database, and non-standard data management customs and cultures among hospitals and provinces. To demonstrate the effectiveness of the appointment system in hospitals and to carry out effective improvement studies of patient management processes, further efforts are needed to review standard data definitions and improve data entry reliability.

CONCLUSIONS

In this study, one year of data from the national "Centralized Physician Appointment System" used in Türkiye was analyzed to understand the impact of the CPAS on normal outpatient public hospital patient wait times by facility care level and province. As other studies have found, monitoring and analyzing data in the healthcare information system is valuable to manage patient wait times and improve healthcare delivery systems using evidence-based data. This study was comprehensive from both administrative and clinical perspectives and included all public secondary and tertiary healthcare facilities in Türkiye. As such, the data retrieved from the national information technology database offers original analyses that are generalizable to Türkiye. The study has three main findings: First, patients with appointments wait on average, 11.18% less than patients without appointments for outpatient visits. The av-

erage wait time for patients with appointments is 89.8 minutes, while the average wait time for patients without appointments is 101.1 minutes. This finding suggests that the CPAS has a positive effect on patient wait times. Further study of patient wait times according to clinical department may offer further insight. Second, only 30.69% of patients made appointments for normal outpatient visits at public secondary and tertiary healthcare facilities. This finding suggests that more work is needed to increase CPAS utilization. Third, patients with appointments in tertiary care facilities wait, on average, 25.82% longer than patients without appointments. This unexpected finding reveals the need for further research into the variables that may affect tertiary level outpatient patient wait times.

Appointment status by gender was also included in the analyses, and it was observed that women had more visits than men (both with and without appointments). This is consistent with multiple studies that demonstrate gender differences in health service utilization (Shafeek Amin & Driver, 2020; Borboudaki et al., 2021; Mondal & Dubey, 2020). Also, a more detailed examination revealed that walk-in visits without appointments were more common for both men and women than visits with appointments. When appointment status at secondary and tertiary care hospitals were investigated separately, the rate of walk-in visits without appointments was higher at both levels of care. As the analysis deepens, however, it is noteworthy that appointment status rates did not vary according to facility care level or province. This finding supports our recommendation of further efforts to increase utilization of the CPAS.

An unexpected finding was revealed in the average patient wait times at secondary and tertiary care facilities. While patients with appointments at secondary care facilities have, on average, 15.46% shorter wait times than patients without appointments, patients with appointments in tertiary care facilities have, on average, 25.82% longer wait times than patients without appointments. Further investigation is required to identify variables driving this outcome. For example, patient wait times may vary according to specific clinical department structures. Further investigation into patient wait times by clinical department is planned.

Abbreviations

CPAS: Centralized Physician Appointment System

NUTS: Nomenclature of Territorial Units for Statistics

Ethical Approval and Consent to Participate: The authors are solely responsible for the comments in the study. Since our study was a retrospective and record/registry-based study, any personal information of patients was not used in this study (Contains non-personal information such as waiting time. Human Participants / clinical data are not included in the study.). Thus, patient approval was not required. Since our study was a record-based and retrospective study, it was approved by the non-interventional ethics committee **(Istanbul Medipol University Non-Interventional Clinical Research Ethics Committee [2017/520])** that the study was conducted without obtaining an informed consent form and that informed consent was not required. Necessary access permissions to this registry have been obtained from the Ministry of Health. Additionally, the use of this data was also approved by the Istanbul Medipol University Non-Interventional Clinical Research Ethics Committee (2017/520). All protocols in the study were carried out in accordance with the relevant guidelines and regulations.

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The Effect of Social Media Addiction on Postural Habit and Awareness in High School Students

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ABSTRACT

The aim of this research was to determine whether social media addiction had an effect on high school students' posture habits and awareness. This study has done among high school students in Keşan, Edirne. Sample size was calculated as 770 and 5 high schools in the district with a total number of 956 students were randomly selected by using the cluster sampling method. This study was conducted face-to-face using a 38-questions personal information form, Social Media Addiction Scale for Adolescents (SMASA) and Postural Habits and Awareness Scale (PHAS). In addition to descriptive and inferential analysis, correlation analysis, multivariate linear regression analysis were conducted. Statistical significance level was taken as $p<0.05$. 771 students in high schools in the sample group participated in the research. In this study, 53.8% of participants are women and 34.9% of students attend from high school grade 3. While the mean value of the Social Media Addiction Scale for Adolescents is 20.2 (7.3), the mean value of the Postural Habits and Awareness Scale is 61.2 (7.0). There is a moderately positive correlation between time spent on social media and SMASA score ($p<0.001$; $\tau=0.440$). There is a weak negative relationship

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between SMASA point and PHAS point ($p<0.001$; $r=-0.186$). One standard deviation increase in the SMASA score reduces the PHAS score by 0,115 standard deviation ($p=0.003$). Based on the results of this study, we can conclude that an increase in social media addiction affects a decrease in postural habits and awareness. Nevertheless, social media addiction cannot be attributed as the sole cause of decreased postural habits and awareness. Reducing inappropriate social media use in students and providing students with exercise habits will be beneficial in terms of preventing bad posture habits during adolescence.
Keywords: Adolescents, High School Student, Postural Awareness, Posture, Social Media Addiction

INTRODUCTION

Standing in an upright and balanced position of an individual person is defined as a posture (Fialka-Moser et al., 1994). Considering that all of the musculoskeletal components of the body help to maintain the posture, although the good posture is difficult to define, possible to imply the good posture as the one that provides the least level of pressure on the joints and the structures that support them (Paterson, 2009). The term "postural fault" defines to a posture that deviates from its normal alignment without structural limitations (Fialka-Moser et al., 1994). Bad posture implies may occur as a result of inefficient use or frank misuse of joints and their associated muscles and ligaments, resulting in progressive and, ultimately, irreversible injury to the body, thereof physical disabilities and possibly painful injuries (Paterson, 2009).

Typical posture including when using smartphones or other touchscreen devices primarily includes holding the device with one or both hands below the level of the eyes, looking at it, and touching the screen with the thumb. Due to that behavior, users could adopt a bad posture, such as forward neck flexion for a prolonged period of time (Eitivipart et al., 2018). According to studies, playing digital games and using social media can develop psychological issues in people like depression, anxiety, and unsocialized, as well as musculoskeletal problems (headache, pain in the neck and shoulders, fatigue, bad posture) (Mustafaoğlu et al., 2018; Rahman et al., 2020). Another study discovered that smartphone use significantly increased lumbar lordosis and thoracic kyphosis (Betsch et al., 2021).

Social media usage is increasing day after day. The proportion of internet usage in Türkiye for people between the ages 16 to 74 increased from 82.6% in 2021 to 85.0% in 2022, according to the findings of a household information technologies usage survey conducted by the Turkish Statistical Institute (TURKSTAT) (Turkish Statistical Institute [TURKSTAT], 2022). Again, the previous household information technology usage survey indicated that children ages between 6 to 15 had been using proportion of internet 82.7%. In this survey, 31.3% of children who use the internet regularly claimed to use it for social media. Furthermore, it was observed that children who use social media regularly spend an average of 2 hours and 54 minutes per day on the social media on weekdays, and an average of 2 hours and 44 minutes per day on weekends (TURKSTAT, 2021).

Addiction is the difficulty to stop using a substance or behavior or the impulsive expression of greater interest in it in daily life (Egger & Rauterberg, 1996). Spending more time participating in internet-related activities, continuing to use the internet despite the awareness that it contributes to continuous or recurrent physical, social, occupational, or psychological problems are only a few of Goldberg's suggested diagnostic criteria for Internet Addiction Disorder (Goldberg, 1996).

In the 11th Revision of the International Classification of Diseases (ICD-11), the World Health Organization (WHO) defined it as a health problem under the name of gaming disorder as a model of gaming behavior characterized by impaired control over gaming, prolonged play despite negative consequences, and increased priority given to play (World Health Organisation, 2020). Nevertheless, the WHO has not yet described social media addiction as a disorder.

Sam defined body awareness as "the conscious perception and understanding of one's body, in relation to somatic and internal sensations which one feels" (Sam, 2013). Cramer et al. described postural awareness as the subjective, conscious awareness of one's own body posture based on proprioceptive feedback from the body's periphery to the central nervous system (Cramer et al., 2018).

Despite there has not been much research on social media addiction and postural awareness, a significant relationship between computer/phone use and neck pain was discovered in a study examining the effects of digital game addiction on the musculoskeletal system of secondary school students. Additionally, a significant relationship was seen between game addiction and wrist, back, and low back pain (Cankurtaran et al., 2022).

Adolescence is a period during which the anterior frontal lobe, which controls impulses and behaviors, continues to develop. Furthermore, it can be said that this is a period when hormonal changes are accompanied by an increase in impulsivity, which is associated with taking a risk and acting without considering the consequences. As with all addictions, adolescence is therefore the riskiest period for the development of behavioral addictions including those to the internet, social media, and in parallel with those problems of a similar nature (Turkish Green Crescent Society, 2022). The purpose of this research was to determine whether social media addiction had an effect on high school students' posture habits and awareness.

METHODOLOGY

High school students in the Keşan district of Edirne consist of the population of this cross-sectional study. According to the information obtained from the Provincial Directorate of National Education, the population size is 3,862 people studying in 15 high schools. Taking 95% confidence interval, 5% margin of error, 50% population proportion and design effect as 2, the sample size was calculated as 700 people. Considering the 10% probability of data loss, a sample size of 770 people was calculated. By using the cluster sampling method, 5 high schools in the district with a total number of 956 students were selected by random.

The dependent variables of the study are social media addiction, postural habits and awareness. The independent variables of the study were determined as age, gender, height, weight, grade level, the time spent on social media, (mobile/fixed-line) continuous accessibility to internet, frequency of exercising, condition of having orthopedic vertebral diseases and social media addiction.

The data of the study were collected by two of the researcher face-to-face questionnaires consisting of 38 questions. The questionnaire used consists of three parts: personal information form, Social Media Addiction Scale for Adolescents (SMASA) and Postural Habits and Awareness Scale (PHAS).

Social Media Addiction Scale for Adolescents (SMASA) was developed according to the APA DSM-5 criteria. The scale form is rated on a 5-point Likert scale (Never-1, Rarely-2, Sometimes-3, Often-4, Always-5). The scale consists of 9 items. A participant can get a minimum of 9 scores and a maximum of 45 scores from the scale. The high total score calculated indicates that the partici-

pant's social media addiction is high, and the low total score indicates that the participant's social media addiction is low (Özgenel et al., 2019).

Postural Habits and Awareness Scale (PHAS) consists of 19 items. The scale form is rated on a 5-point Likert scale. Each item of the scale is scored between (1) strongly disagree and (5) strongly agree. Seven items are reverse coded. The Postural Habits (PH) subscale has a maximum possible score of 35, and the Postural Awareness (PA) subscale has a maximum possible score of 60. The maximum total score that can be obtained from the scale is 95. Good posture and awareness are indicated by a high score (Bayar et al., 2022).

Researchers transferred the data to Microsoft Excel and used IBM SPSS Statistics (Version 29.0) to analyze them. Descriptive data of the participants are presented with summary data such as number, percentage, mean, standard deviation, median and interquartile range. Student's t-test, ANOVA, Mann-Whitney U and Kruskal Wallis tests were used to analyze the difference between groups. Pearson and Kendall tau-b correlation analysis were used to analyze the relationship between continuous and ordinal variables. Multivariate linear regression analysis was used to examine the effect of independent variables on the Postural Habits and Awareness Scale score. Statistical significance level was taken as $p<0.05$.

Necessary permissions for this study were approved from Edirne Provincial Directorate of National Education and Istanbul Medipol University Non-Interventional Clinical Research Ethics Committee on 24.11.2022 (Number: E-10840098-772.02-7181).

RESULTS

In this study, the data of 771 high school students in the sample group were included within the scope of the research. As shown in Table 1, 53.8% of the participants are female. 37.5% of students indicated spending between 1-3 hours a day on social media. 27.5% of those responding to the survey said they exercised less than once a week. 85.2% of students do not have any of the orthopedic vertebral diseases specified in the questions, and 95.7% of all students have the right dominant side. Among the orthopedic vertebral diseases indicated, 42 of the participants had only thoracic kyphosis, 18 had only scoliosis, 15 had only loss of cervical lordosis, 13 had only thoracolumbar kyphosis, and 5 had only loss of lumbar lordosis.

Table 1: Identifying characteristics of participants

	n	%
Gender		
Female	415	53.8
Male	356	46.2
Grade		
9th Grade (1st year)	148	19.2
10th Grade (2nd year)	147	19.1
11th Grade (3rd year)	269	34.9
12th Grade (4th year)	207	26.8
Continuous accessibility to mobile internet		
Yes	702	91.1
No	69	8.9
Continuous accessibility to fixed-line internet		
Yes	681	88.3
No	90	11.7
The time spent on social media		
0-1 hour	70	9.1
1-3 hours	289	37.5
3-5 hours	266	34.5
5-7 hours	79	10.2
>7 hours	67	8.7
Frequency of exercising		
Less than once a week	212	27.5
Once a week	166	21.5
2-3 times per week	202	26.2
4-5 times per week	80	10.4
6-7 times per week	111	14.4
Condition of having orthopedic vertebral diseases		
No	657	85.2
Yes*	114	14.8
Thoracic kyphosis	49	6.4
Scoliosis	34	4.4
Thoracolumbar kyphosis	23	3.0
Loss of cervical lordosis	21	2.7
Loss of lumbar lordosis	8	1.0
Dominant side of the body		
Right side	738	95.7
Left side	33	4.3
Total	**771**	**100**

* Because of those with multiple vertebral diseases, the sum of the subgroups exceeds 100%.

As shown in Table 2, mean age of the participant is 16.0 (1.2). While the mean value of the Social Media Addiction Scale for Adolescents is 20.2 (7.3), the mean value of the Postural Habits and Awareness Scale is 61.2 (7.0).

Table 2: Identifying values of the participants' age, height, weight, SMASA and PHAS scores

	Mean (SD)	Median (IQR)
Age	16.0 (1.2)	16.0 (15.0-17.0)
Height (cm)	171.1 (9.3)	170 (165.0-178.0)
Weight (kg)	63.1 (13.6)	60 (53.0-70.0)
SMASA Score	20.2 (7.3)	19 (15.0-25.0)
PHAS Score	61.2 (7.0)	61 (57.0-66.0)
PH Score	21.0 (4.3)	21 (18.0-24.0)
PA Score	40.3 (5.0)	40 (37.0-44.0)

SD, standard deviation; IQR, interquartile range; SMASA, Social Media Addiction Scale for Adolescents; PHAS, Postural Habits and Awareness Scale; PH, Postural Habits Subscale; PA, Postural Awareness Subscale.

As can be seen in Table 3, a significant difference was found between the genders for the SMASA, PHAS, and Postural Habits subscales scores ($p=0.002$, $p=0.009$, and $p<0.001$, respectively). A significant difference was found between the grades for the SMASA scores ($p=0.006$). This significant difference is due to first year of high school get higher scores than other grades students.

Table 3: Comparison of the scale results to the descriptive characteristics of the participants

	n	SMASA	PH	PA	PHAS
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Gender					
Female	415	20.9 (7.3)	20.2 (4.0)	40.4 (4.7)	60.6 (6.7)
Male	356	19.3 (7.1)	21.9 (4.4)	40.1 (5.2)	61.9 (7.2)
p		**0.002**	**<0.001**	0.332	**0.009**
Grade					
9th Grade (1st year)	148	21.8 (7.8)	21.0 (4.4)	40.9 (4.8)	61.9 (7.0)
10th Grade (2nd year)	147	19.6 (7.5)	21.0 (4.2)	39.4 (5.2)	60.4 (7.0)
11th Grade (3rd year)	269	20.3 (7.0)	20.8 (4.4)	40.4 (4.7)	61.2 (7.0)
12th Grade (4th year)	207	19.2 (6.9)	21.1 (4.1)	40.2 (5.0)	61.3 (6.9)
p		**0.006**	0.899	0.057	0.350

SD, standard deviation; SMASA, Social Media Addiction Scale for Adolescents; PH, Postural Habits Subscale; PA, Postural Awareness Subscale; PHAS, Postural Habits and Awareness Scale.

According to Table 4, condition of having orthopedic vertebral diseases resulted in a significant increase in the SMASA, PHAS, and Postural Habits subscales ($p<0.001$ in all comparisons)**.** When vertebral diseases are evaluated in detail, SMASA scores of those with thoracic kyphosis are significantly higher, PHAS and Postural Habits subscale scores are lower ($p=0.007$, $p<0.001$ and $p<0.001$, respectively). Likewise, the score of SMASA is higher in those with thoracolumbar kyphosis, however the scores of Postural Habits subscale are higher in those without thoracolumbar kyphosis and scoliosis ($p=0.001$, $p=0.003$ and $p=0.027$, respectively).

Table 4: Comparison of the scale results against the vertebral diseases the participants have

	n	SMASA	PH	PA	PHAS
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Condition of having orthopedic vertebral diseases					
Yes	114	22.4 (8.2)	18.9 (4.1)	39.6 (5.0)	58.5 (6.4)
No	657	19.8 (7.00)	21.3 (4.2)	40.4 (4.9)	61.7 (7.0)
p		**<0.001**	**<0.001**	0.112	**<0.001**
Thoracic kyphosis					
Yes	49	22.8 (8.2)	18.1 (3.8)	39.0 (4.9)	57.1 (6.5)
No	722	20.0 (7.2)	21.2 (4.2)	40.3 (4.9)	61.5 (6.9)
p		**0.007**	**<0.001**	0.063	**<0.001**
Scoliosis					
Yes	34	22.6 (10.0)	19.4 (4.0)	40.3 (5.5)	59.7 (6.4)
No	737	20.0 (7.1)	21.0 (4.3)	40.3 (4.9)	61.3 (7.0)
p		0.156	**0.027**	0.982	0.181
Thoracolumbar kyphosis *					
Yes	23	26.3 (9.7)	18.7 (4.2)	40.9 (4.7)	59.6 (5.8)
No	748	20.0 (7.1)	21.0 (4.3)	40.2 (4.9)	61.3 (7.0)
p		**0.001**	**0.003**	0.299	0.211
Loss of cervical lordosis *					
Yes	21	21.4 (6.9)	20.1 (4.4)	38.7 (5.1)	58.8 (6.2)
No	750	20.1 (7.3)	21.0 (4.3)	40.3 (4.9)	61.3 (7.0)
p		0.338	0.275	0.122	0.129
Loss of lumbar lordosis *					
Yes	8	17.0 (7.3)	22.5 (4.2)	41.4 (3.6)	63.9 (5.6)
No	763	20.2 (7.3)	21.0 (4.3)	40.2 (4.9)	61.2 (7.0)
p		0.202	0.242	0.556	0.309

*Mann Whitney-U test. SD, standard deviation; SMASA, Social Media Addiction Scale for Adolescents; PH, Postural Habits Subscale; PA, Postural Awareness Subscale; PHAS, Postural Habits and Awareness Scale.

As shown in Table 5, whereas there was no significant difference in SMASA scores between continuous access to mobile and fixed-line internet, a difference was found between the categories of times spent on social media ($p<0.001$). The significant difference in the SMASA results according to the time spent on social media is due to the fact that social media users in other groups scored lower than the following categories.

Table 5: Comparison of SMASA results to the participants' internet usage specifications

		SMASA
	n	**Mean (SD)**
Continuous accessibility to mobile internet		
Yes	702	20.3 (7.3)
No	69	19.0 (6.9)
p		0.187
Continuous accessibility to fixed-line internet		
Yes	681	20.3 (7.3)
No	90	19.0 (6.8)
p		0.102
The time spent on social media		
0-1 hour	70	15.2 (5.7)
1-3 hours	289	17.8 (6.0)
3-5 hours	266	21.0 (6.4)
5-7 hours	79	24.8 (8.2)
>7 hours	67	26.6 (7.9)
p		**<0.001**

SD, standard deviation; SMASA, Social Media Addiction Scale for Adolescents.

As seen in Table 6, the frequency of exercise resulted in a significant variation in the PHAS and PH subscales ($p<0.001$ and $p<0.001$, respectively). The significant difference is due to the lower scores of those who exercised less than once a week compared to the other participants. Furthermore, students with dominant left side determined higher scores on both PHAS and PH subscales ($p=0.013$ and $p=0.017$, respectively).

Table 6: Comparison of PHAS results based on participants' characteristics of exercising and dominant side of their bodies

	n	PH	PA	PHAS
		Mean (SD)	Mean (SD)	Mean (SD)
Frequency of exercising				
Less than once a week	212	19.8 (4.3)	39.3 (5.3)	59.1 (7.6)
Once a week	166	20.7 (4.1)	40.7 (3.9)	61.4 (5.5)
2-3 times per week	202	21.4 (4.3)	40.4 (4.9)	61.8 (7.2)
4-5 times per week	80	21.8 (3.8)	40.8 (5.3)	62.6 (6.0)
6-7 times per week	111	22.2 (4.2)	40.8 (5.2)	63.0 (7.0)
p		**<0.001**	0.023	**<0.001**
Dominant side of the body				
Right side	738	20.9 (4.3)	40.2 (4.9)	61.1 (7.0)
Left side	33	22.7 (4.5)	41.5 (4.3)	64.2 (6.6)
p		**0.017**	0.150	**0.013**

SD, standard deviation; PH, Postural Habits Subscale; PA, Postural Awareness Subscale; PHAS, Postural Habits and Awareness Scale.

Table 7 demonstrates a moderately positive correlation between time spent on social media and SMASA score ($p<0.001$; $\tau=0.440$). A weak negative correlation was found between the SMASA score and the PHAS score ($p<0.001$; $r=-0.186$)**.** Scatter plot of this correlation is shown in Figure 1.

Table 7: The correlation analysis of participants' identifying data and scale scores

		Age	The time spent on social media*	Frequency of exercising*	Height (cm)	Weight (kg)	SMASA Score
SMASA Score	r p	-0.084 **0.019**	0.440 **<0.001**	-	-	-	-
PH Score	r p	0.042 0.241	-0.108 **0.003**	0.195 **<0.001**	0.118 **0.001**	0.093 **0.010**	-0.273 **<0.001**
PA Score	r p	0.007 0.855	-0.064 0.075	0.096 **0.007**	0.007 0.837	-0.029 0.427	-0.026 0.465
PHAS Score	r p	0.031 0.396	-0.112 **0.002**	0.188 **<0.001**	0.077 **0.031**	0.037 0.309	-0.186 **<0.001**

*Kendall's tau. SMASA, Social Media Addiction Scale for Adolescents; PH, Postural Habits Subscale; PA, Postural Awareness Subscale; PHAS, Postural Habits and Awareness Scale.

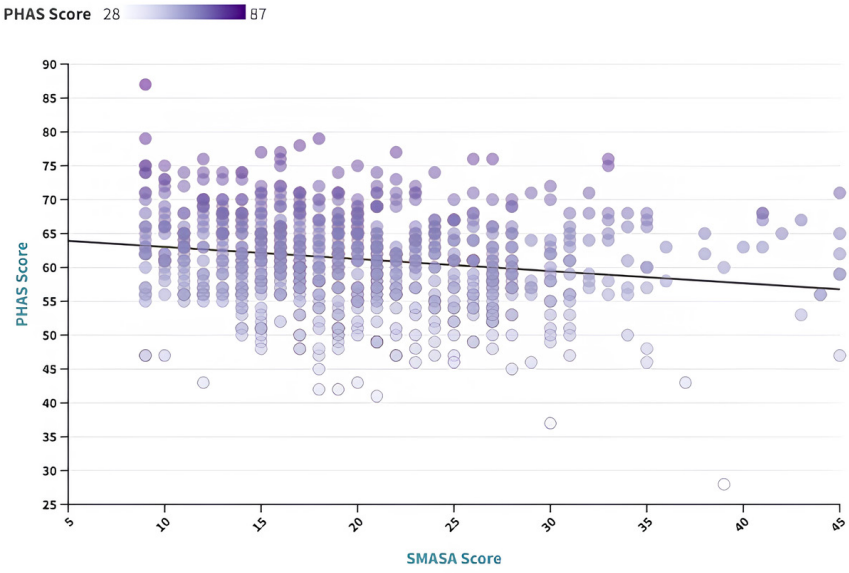

Figure 1. Distribution chart of the relationship between SMASA score and PHAS score. SMASA, Social Media Addiction Scale for Adolescents; PHAS, Postural Habits and Awareness Scale

The regression model developed for analyzing PHAS data is shown in Table 8. The Adjusted R value of the model is 0.087 ($p<0.001$). One standard deviation increase in the SMASA score reduces the PHAS score by 0,115 standard deviation ($p=0.003$).

Table 8: The regression model set up for analysis of PHAS scale results

Variable	β	Standard Error	Beta	t	p
Fixed	50.878	6.795			
Gender*	-0.034	0.699	-0,002	-0.048	0.961
Age	0.277	0.215	0,046	1.286	0.199
Height (cm)	0.025	0.042	0.034	0.601	0.548
Weight (kg)	-0.007	0.024	-0.014	-0.297	0.766
The time spent on social media	-0.350	0.255	-0.053	-1.371	0.171
Having orthopedic vertebral diseases**	-3.031	0.686	-0.154	-4.418	<0.001
Dominant side of the body***	3.142	1.193	0.091	2.633	0.009
Frequency of exercising	0.928	0.188	0.181	4.944	<0.001
SMASA Score	-0.110	0.038	-0.115	-2.931	0.003

R: 0.313 R^2: 0.098 Adj. R: 0.087 p<0.001
*Ref: Male, **Ref: No, ***Ref: Right. PHAS, Postural Habits and Awareness Scale; SMASA, Social Media Addiction Scale for Adolescents.

DISCUSSION AND CONCLUSIONS

In this study which studied the effects of social media addiction on posture, postural habits and awareness in high school students, the mean value for SMASA was found to be 20.2 (7.3). This value indicates that the participants' social media addiction is not high in general. Likewise, the mean PHAS value of 61.2 (7.0) indicates that the participants have generally good postural habits and high awareness based on self-reporting.

Studies in different populations have shown that bad postural habits are more common in adolescents. Although there was no difference between grades in terms of postural habits in our study, the prevalence of bad posture was found to be high in a study by students aged 11-16 years and have seen this prevalence decreased over a 3-year follow-up period (Minghelli et al., 2016; Noll et al., 2017). The investigation of postural habits and awareness based on self-report and different societies may have led to these differences between studies, but further examinations are needed to fully understand.

According to the findings of our study, there is a weak negative correlation between social media addiction which is determined by the SMASA score, and postural habits and awareness. SMASA score shows a positive correlation with the time spent on social media. In systematic reviews, it has been reported that increased inappropriate use of smartphones, which are frequently used to access social media, causes musculoskeletal system problems in the head, neck and arm areas (Achangwa et al., 2022; Eitivipart et al., 2018).

Social media and technological devices like phones can cause developmental issues in alongside musculoskeletal problems depending on overuse, frequency, and duration of use (Mustafaoğlu et al., 2018). A cross-sectional study conducted in the university community discovered that increased smartphone use caused considerable musculoskeletal pain in people who use their smartphones for more than 60 minutes daily (Han & Shin, 2019). Studies have shown that an increase the duration of computer use, along with phone usage, cause to an increase in trunk and head flexion, and a decrease in lumbar angle. Physical examinations and computer-aided systems have demonstrated the findings (Brink et al., 2014; Straker et al., 2007). In our study, an increase in social media addiction was demonstrated to have a negative impact on postural habits and awareness as indicated with use of scales by participants' self-report. However, bad postural habits and the decrease in awareness cannot be attributed to just social media addiction, and the effects of other variables should also be evaluated because the correlation indicated in our study is weak.

In this study, we observed that participants with orthopedic vertebral disease had bad postural habits and awareness, and having a vertebral disease caused a decrease of approximately 3 points in the scale score. At the same time, social media addiction scores of participants with vertebral disease were found to be higher than those without vertebral disease. In a study by Betsch et al. also were found that smartphone use leads to significant changes in spinal posture, such as increased thoracic kyphosis and body tilt while standing and walking (Betsch et al., 2021).

In this study, the weekly exercise frequency was positively related to PHAS scores. There are studies that address the negative effects of exercise habits on posture. The adverse effects caused by different types of exercise may increase as the duration of exercise increases (Salsali et al., 2023; Xing & Popik,

2020). As in the systematic review by Kiers et al. there are also studies that mention the effect of different types of exercise on postural awareness and the determinant effect of exercise type and frequency on awareness (Kiers et al., 2013). However, our study does not provide an evaluation of exercise types. In a systematic review examining the effectiveness of exercise interventions in improving postural malalignment in the body; It is stated that the available evidence on the efficacy of exercise in postural malalignment is insufficient and mostly of low or moderate quality (Bayattork et al., 2020). Another systematic examination to evaluate the efficacy of scoliosis-specific exercise (SSE) in adolescent patients with adolescent idiopathic scoliosis (AIS) similarly showed a lack of high-quality evidence to recommend the use of SSE for AIS (Romano et al., 2012). Therewithal, Pilates, McKenzie therapy, and functional restoration have been found to be more effective than other types of exercise treatments in reducing pain intensity and functional limitations in a systematic review that including randomized controlled trials in adults for chronic non-specific low back pain, which can be shown as another negative effect of inappropriate phone use. In addition, a negative correlation was observed between the duration of exercise, low back pain and functional limitation in the most types of exercise performed (Cankurtaran et al., 2022; Hayden et al., 2021).

When looking at the data from a secondary analysis of a randomized controlled trial conducted by Lauche et al. on adult participants with at least moderately chronic nonspecific neck pain, investigating whether postural awareness contributed to exercise-induced improvements in neck pain intensity, it was observed that the postural awareness of the participants, including their posture with Tai Chi and neck exercises, changed. They reported being more aware of their sitting postures compared to their previous state (Lauche et al., 2017). When the study of Lauche et al. is evaluated with the results of our study, it is thought that the evaluation of the effect of encouraging students to do sports with lessons such as physical education will also provide useful findings on the improvement of postural habits and expanding awareness. Further studies should be carried out to obviate postural and musculoskeletal disorders through physical exercise.

In the study of social media usage and addiction among high school students by Mehmet Güney and Taşkın Taştepe, considering the average score (19.31), it was seen that the social media addiction scores of the adolescents were close to

the average score in our study. Over again, other similarity to our findings it was observed that women's social media addiction levels were higher than men (Güney & Taştepe, 2020). In terms of posture, that was found that female students' Postural Habits subscale scores and total PHAS scores were lower than male students. Female adolescents had a higher prevalence of incorrect posture than male in a population-based cross-sectional study conducted in China. Researchers believe that the worsening postural habits in female students who enter puberty earlier than males and experience changes in body perception may be explained also by their have lower levels of physical activity (Yang et al., 2020). For this reason, targeting female students becomes more important in interventions to be conducted for both social media addiction and gaining correct posture habits.

This research has some limitations. Since it is a cross-sectional study, the current condition can be determined, but no certain results concerning the cause-and-effect relations can be established. Furthermore, some students refused to participate in the research because the study was based on volunteerism. As postural habits and awareness are based on participants' self-report, detecting of postural characteristics have some limitations. In addition, the social media addiction scale used in this research does not examine the use of devices such as smartphones and computers for gaming and other purposes.

In conclusion, in this study which was conducted with high school students, it was found that posture habits and awareness which were determined based on the self-report of the students, affected by variables of social media addiction, frequency of exercising, and having orthopedic vertebral diseases. Reducing inappropriate social media use in students and providing students with exercise habits will be beneficial in terms of preventing bad posture habits during adolescence. Nevertheless, the impact of physical exercise on the correction of postural disorders necessitates further studies. Due to not only have higher social media addiction but also worse postural habits, it is suggested that female students, in particular, should be taken into account while planning an intervention.

Ethical Approval: Istanbul Medipol University Non-Interventional Clinical Research Ethics Committee - 24.11.2022 (Number: E-10840098-772.02-7181)

Authors' Contributions: The data of the study were collected by KEA and NY of the researchers. These data were analyzed by KEA ans AZTF. The researchers are taken parts in the writing of the article for abstract and introduction NY, BŞ, KEA and FA, for methods NY and KEA, for results KEA and AZTF also, for discussion and conclusion all researchers have part in. Besides, the organizations of article were arranged by KEA and AZTF.

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A Critique and Bibliometric Analysis of the Studies on Health System Effectiveness

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ABSTRACT

This study examines the literature on the evaluation and measurement of the performance of healthcare systems. It has been determined that various methods and criteria are used for evaluating healthcare systems in the literature, and these evaluations generally rely on inputs such as healthcare expenditures, sociodemographic structure, healthcare facilities, and personnel numbers. As a result of the use of different evaluation criteria and methods in studies, it has been found that the rankings of the most successful countries also vary. This indicates that publication bias and the input parameters can influence evaluation results. The findings suggest that further research is needed for a more accurate assessment of healthcare system performance and the establishment of a platform involving all healthcare systems globally. Additionally, the bibliometric analysis of the study reveals which countries are focusing on studies related to healthcare system performance and which topics are being researched more. It emphasizes the importance of collaboration and knowledge sharing among countries. Adopting a more comprehensive and multidimensional approach to evaluating healthcare systems, determining standardized evaluation criteria, and using different methods together to obtain more robust results are recommended. Implementing these recommendations will contribute to

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more accurately measuring and improving the effectiveness and efficiency of healthcare systems.

Keywords: Bibliometric Analysis, Health Systems Performance, Measurement Assessment, OECD Countries, Türkiye

INTRODUCTION

Before it was defined as "a state of complete well-being" by the World Health Organization (WHO), health was described as a need that creates a common image in everyone's minds when it is mentioned but cannot be fully revealed at a conceptual level. Human sciences have focused on this concept and looked at it from their own perspectives. For example, in the 1948 Universal Declaration of Human Rights in sociological and legal terms, the concept was viewed on the basis of "rights" (Leary, 1994). From a medical perspective, health is generally associated with disease and defined as the absence/opposite of disease and disability (Svalastog et al., 2017). Thus, health can be analyzed and discussed at the level of sub-concepts that may be related. The factors that can be affected by this concept have been relatively more prominent than all other related sub-headings. The factors affecting health, and the diversity and effects of these factors have been investigated by many researchers. In order to understand their impact on human health, it is necessary to evaluate many different areas such as physical, psychological, environmental and genetic factors (Brevik et al., 2020). Assessing the factors affecting health also provides an understanding of derived concepts such as the health system.

The health system is a complex structure that embodies the fragility of humanity and the need for solidarity, undertaking the mission of protecting and improving life. It constitutes one of the cornerstones of a society's well-being and determines its quality of life through its success in the fight against disease. Health systems are generally defined as a structure that regulates the organization, financing, and access to health services in a society or country. Health systems are formed through the interaction of a number of factors and often include many variables such as history, culture, economy, political structure, and social norms.

Reexamining Concepts for a New Perspective

Healthcare System

The health system is a complex structure that aims to provide a healthy, happy, productive, and qualified life through the effective use of public resources in a country (Atun & Moore, 2021). As a social system, it is a structure that interacts with its environment and involves complex relationships between various components.

In order to understand the functioning of the health system well, it is necessary to examine the basic components in detail such as the inputs needed for the production of health services, the processes followed, and the outputs obtained. Inputs include financing resources, information and knowledge, human resources, medical equipment, and materials. However, inputs are not limited to material resources; policymakers and civil society organizations also have a significant impact on the health system. On the other hand, the success and efficiency of the health system are closely related to the effective use of these inputs and the improvement of the health status of the country in general after the delivery of health services to individuals. Health policies and the strategies pursued to realize these policies can have a direct impact on the delivery, financing, access, and quality of health services, and therefore, they determine the success of the health system.

Health System Performance and Efficiency

Performance is generally defined as the quantitative and qualitative determination of the extent to which decision-makers are able to achieve the targeted result with the efforts they make or the inputs used to realize their objectives (Spekle & Verbeeten, 2014). Efficiency is the measure of how well resources are used and effective results are achieved. Although productivity means different things to different people and disciplines, it is basically the relationship between the quantity and quality of goods and services produced and the resources used to produce them.

Health system performance and efficiency measure the ability of a country or region to deliver and manage health services (Kruk & Freedman, 2008). These concepts are related to the utilization of resources related to the delivery of health services but are often associated with health outcomes. The efficien-

cy of the health system aims to achieve the best results through the optimal use of resources. When performance, which can be briefly summarized as the degree to which a health system achieves the set targets, comes together with efficiency gains, which can be defined as producing the highest level of output using the minimum level of input, the targeted results in the health system are achieved in the best way (Porter, 2010).

Increasing health expenditures raise questions about whether the resources allocated to health systems are being used appropriately. The concept of health systems performance has been discussed in detail in the report published by WHO in 2000, with discussions on both the efficient use of resources and the objectives to be achieved. Efforts and discussions in the direction of both monitoring the improvements in the performance levels of countries and benefiting from the experiences of other countries in relative terms have also tended to increase rapidly.

Many factors affect health system performance. Access to health services, quality of health services, training of health personnel, impoverishing health expenditures, improvement in health status, and appropriateness of health policies are among the most discussed factors (Arah et al., 2003; Eze et al., 2020).

Performance indicators aimed at measuring the effectiveness of healthcare systems (such as life expectancy at birth or the ratio of impoverishing health expenditures) and resource utilization indicators (such as total healthcare expenditures or number of healthcare workers) can contribute to the classification of a country's healthcare system as efficient or inefficient. The obtained results help identify the strengths and areas needing improvement within the healthcare system. However, due to the heterogeneous nature of compared healthcare systems and their vastly different organizational, financing, delivery, and infrastructure systems, the results are relative. Furthermore, considering the significant goals of healthcare systems, such as increasing both the length and quality of life, accepting and understanding a certain level of inefficiency may reduce countries' efforts and willingness to change their healthcare systems. For example, developed countries generally have better access to healthcare and the capacity to provide higher-quality services. They often allocate more resources to healthcare financing and continually improve healthcare infrastructure. Since a country's level of healthcare status is directly associated with its level of development, even if it is classified as inefficient, a country may be

reluctant to reduce healthcare expenditures or allocate additional resources to the healthcare system due to its impact on improving healthcare status.

The effectiveness of health systems is critical for societies' access to and quality of health services. However, the role of factors such as publication bias in the publication process and interpretation of the results of research in the literature should not be neglected. The aim of this paper is to draw the attention of researchers to such a risk area. For this purpose, a bibliometric analysis of the studies that comparatively examine the health system performances of countries in the last three decades years has been conducted and the results obtained are discussed. Such a perspective may help health policymakers, healthcare providers, and researchers to obtain more accurate and reliable information on the performance of health systems and to learn better lessons from the *experiences of other countries*.

A Bibliometrics Analysis on Health System Performance Measurement

A total of 1148 studies between the years 1992-2023 (the first publication on health system performance measurement appeared in 1992) were reached and a bibliometric analysis was carried out by using the keywords provided by the authors of these studies. Those studies using the keyword "health system performance measurement" in all fields and published in English in the Web of Science database were stored in Rayyan to evaluate the adequacy of the studies. R-biblioshiny, which is an open-source program, was used for bibliometric analysis.

A significant portion of the studies analysed were produced by authors associated with the United States of America (USA) and many of these studies were published in Medical Care, International Journal of Quality in Health Care, and BMC Health Services Research. The relationship between performance and quality is an undeniable fact and this is also reflected in the studies. Although more general performance criteria are used to measure the performance of the country's overall health system, quality, patient satisfaction, and the state of primary health care services in countries will continue to be the subject of constant debate. In addition, analysis methods such as data envelopment analysis and balanced scorecard used in performance measurement seem to be the main themes discussed in these studies (Figure 1).

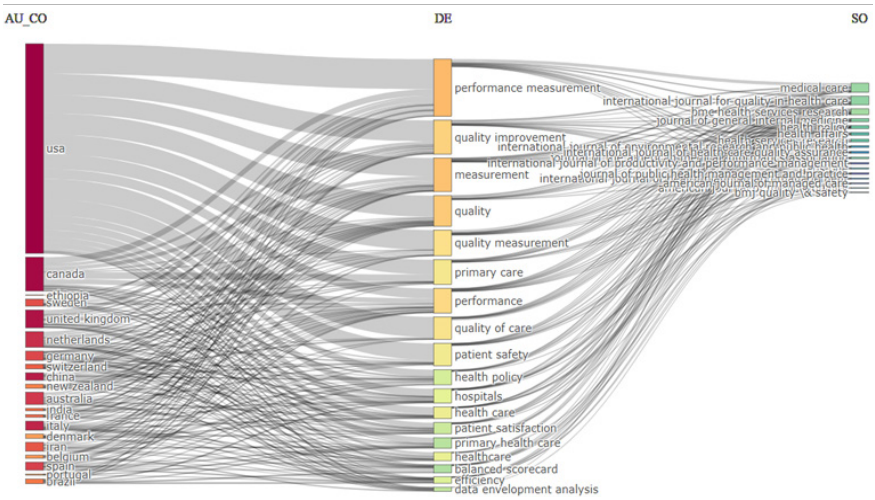

Figure 1. Three fields plot showing the country of correspondent author (AU_CO), author's keywords (DE), and journals publishing studies (SO)

The word cloud in Figure 2 clearly shows that quality management and improvement, which are important components of performance, are frequently used in health system performance evaluation studies. However, the visibility of concepts such as patient safety and satisfaction among the frequently used words suggests that patient-oriented measurement methods gain more importance in efficiency measurement studies.

Figure 2. Keyword frequencies used by the authors

Figure 3 shows the evolution of studies on health system performance over the years based on the keywords used by the authors. Among these topics, it seems the keyword "performance measurement", together with "quality measurement and improvement", has been increasing its importance among the most frequently studied topics over the years. Along with both of these topics, the data envelopment analysis technique, which is frequently used in technical efficiency measurement, is one of the main themes that continues to maintain its importance. In addition, machine learning seems to be one of the new topics that will be frequently discussed in performance measurement studies in the coming periods. Interestingly, well-being was found to be a topic that is no longer studied or is not often found in performance measurement studies.

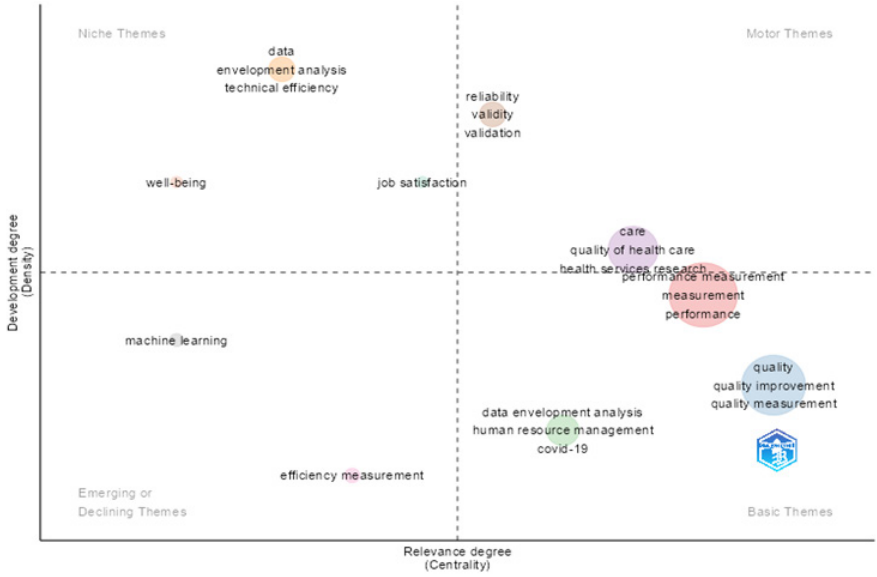

Figure 3. Evolution of issues related to health system performance

Looking at the evolution of topics over specific periods, Figure 4 reveals that studies on health system performance between 1992 and 2011 were more specific and about quality management, whereas the concept of performance measurement has become more inclusive and broader in the following years. It is important to mention that such a broad and inclusive concept may cause more specific and important concepts (patient safety or equity discussions) to be overlooked.

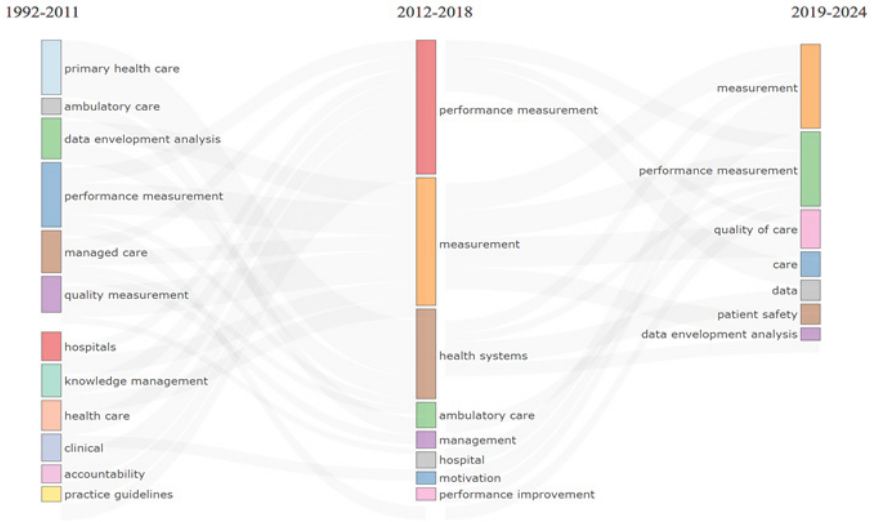

Figure 4. Evolution of study topics related to health systems by years

Comparison of Country Health Systems by Performance Levels

The results obtained through bibliometric analysis do not produce results on which countries are relatively more efficient or inefficient but rather provide some information on the areas and countries where the topics are concentrated and their evolution over the years. However, within the scope of this study, comparisons of countries in terms of health system performance results were also desired by evaluating full-text articles to see how Türkiye is good at performance level compared to other countries, and if there is publication bias in comparing countries either in selection of relevant inputs or output indicators or in using different measurement methods. Based on the evaluations of two researchers, 11 studies were analyzed carefully to get an idea on Türkiye's relative place and publication bias.

The expenditure data of 30 OECD countries were analyzed in the study of Castaldo et al. The results of the study found that the UK, Türkiye, Switzerland, Sweden, and Spain were among the least efficient countries. The most efficient countries were Australia, Austria, Belgium, Czech Republic, and Denmark. The most important point emphasized in the study is that if countries were fully efficient, they could use on average about 30-40% fewer resources to achieve the same results (Castaldo et al., 2020).

In a study by Ersoy and Aktaş, data from 37 OECD countries in 2020 were analyzed. They ranked the top five efficient countries as Australia, Austria, Belgium, Canada, and Chile. However, the USA, the UK, Türkiye, Switzerland, and Sweden were found to be the five least efficient countries (Ersoy & Aktaş, 2023). The study of Gavurova et al. (2021) used 2000, 2008, and 2016 data from OECD countries. The study used "the health-adjusted life expectancy" as one of the output variables and ranked the five least efficient countries as the USA, the United Kingdom, Türkiye, and Switzerland, and the five most efficient countries as Australia, Austria, Belgium, Canada, and the Czech Republic.

Ngami and Ventelou (2023) used the data of OECD countries by using stochastic frontier model (SFM), and Türkiye was found to be among the least successful countries like Mexico, Latvia, Lithuania, and Estonia. Şenel and Cengiz (2016) also analyzed the data of 29 OECD countries between 1997-2009 by using Bayesian Stochastic Frontier Analysis (BSFA) method, and they also listed Türkiye as one of the least successful countries. They found Australia, Greece, Korea, Iceland, and Mexico as successful countries.

In the study of Tchouaket et al. (2012), 2007 data from 27 OECD countries were analyzed. The data used in the study were evaluated in the dimensions of efficiency, productivity, and productivity based on a certain average value by classification method. For this reason, the results of the study were evaluated at different levels in three different groups. In the study, Canada, Denmark, Spain, Finland, and Greece were among the top five countries that were found to be successful in terms of efficiency. Germany, Australia, the USA, Luxembourg, and the Czech Republic were ranked among the least successful countries. Türkiye was not among the countries evaluated in this study.

The study by Çelik et al. (2017) used the data of OECD countries between 1995 and 2013 by using Output-Oriented DEA analysis. They used GDP per

capita, health expenditures per capita, literacy, and urbanization rates as input variables. Life expectancy at birth and out-of-pocket payment ratio relative to total health expenditures were selected as output variables. The authors discussed that the health outcomes of the countries changed over a period of 18 years, and Türkiye was found to be one of the efficient countries together with Belgium, New Zealand, Finland, Korea, and the United Kingdom. However, Russia, Azerbaijan, Armenia, Montenegro, and Lithuania were found to be the least efficient countries.

DISCUSSIONS AND CONCLUSIONS

This study provides a brief review of the current state of the literature on the evaluation and performance measurement of health systems. It is clear that different methods and criteria in relation to the situation in question are used in the literature to measure the efficiency of health systems and that these measures are generally based on inputs such as health expenditures, sociodemographic structure, health facilities, and number of personnel. Although the studies generally have different structures and types, they have a common structure in using inputs such as health expenditures, sociodemographic structure, health facilities that are important for health service delivery, number of personnel, and obtaining an evaluation result from the inputs used (Braithwaite, 2020; Reibling et al. 2019; Sevim & Aldogan 2024).

In the majority of the studies, it was found that methods such as Data Envelopment Analysis (DEA) were used extensively. It was also observed that the peak period of evaluation studies was between 2020 and 2024 and that there was a significant increase in the number of publications in this field, especially after 2016. Since different evaluation criteria and methods were used in the evaluation studies, it was determined that the rankings of the most successful countries also differed. This revealed that publication bias and the input parameters used may affect the evaluation results.

It is an obvious fact that different results are obtained with similar parameters and methods. Based on this fact it might be biased to discuss the studies have publication bias. However, this fact also recommends that the efficiency of health systems mainly depends on how you define and measure efficiency as well as the used variables. It also mainly depends on what you want to achieve.

Decision-makers, health policy makers, and even researchers may prefer to have different perspectives, use different measurement methods, and even limit the pool of countries to which they can compare. All of these choices may have scientific and justifiable justifications. In the end, all the results of analyses and classifications of efficient and inefficient countries may become relative. In such a situation, evaluating the performance of a health system may become a means for a health policymaker or decision-maker to justify his or her decisions or to improve the prestige of the country, rather than an objective point of view.

The first recommendation based on the findings of this study is that more research is needed to more accurately assess the performance of health systems. The second recommendation might be to create a platform where all health systems at the global level can engage and critically interact. In this context, it is important to adopt a more comprehensive and multifaceted approach to the evaluation of health systems, to establish standardized evaluation criteria and to achieve more robust results by combining different methods. Implementation of these recommendations will contribute to more accurate measurement and improvement of the effectiveness and efficiency of health systems.

Ethical Approval: Authors declare that the study presented in the manuscript entitled "A Critique of Publication Bias on Health System Effectiveness: A Bibliometric Analysis" does not require ethical approval.

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Health Literacy Level of Patients Applying to Chest Diseases Outpatient Clinic and Related Factors: The Case of a Selected Training and Research Hospital

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ABSTRACT

Health literacy is an important skill and capacity that affects individuals' ability to make decisions about their health and manage their health. It is associated with low health literacy, unnecessary outpatient clinic visits, high health expenditures, late diagnosis, and risky health behaviors. This research was conducted with 373 patients who applied to the Chest Diseases outpatient clinic of a

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training and research hospital in Istanbul. 20.4% (n=76) of the participants had low health literacy and 49.9% (n=186) had middle health literacy. According to the gender of the patients, while there was no significant difference in access to treatment health services, total score and self-efficacy subscale dimensions, the median of the health promotion subscale dimension was higher in women than in men and was found to be statistically significant. Statistically significant differences were found in access to treatment health services, health protection development, total score and self-efficacy subscale dimensions according to the patients' educational status. Statistically, significant differences were found in access to therapeutic health services, health promotion, total score and self-efficacy subscale dimensions according to the patients' occupation. Health literacy level was found to be low in one out of every four patients. Gender, educational status and occupation were found to be effective on health literacy level.
Keywords: Chest Diseases, Health Literacy Level, Hospital

INTRODUCTION

According to the World Health Organization, health literacy involves achieving a level of personal knowledge, skills, and confidence that enables individuals to improve their own health and the health of their community by changing personal lifestyles and living conditions (Fernandez et al., 2016). Health literacy is an important public health goal and the health literacy level of individuals is of great importance in increasing the health level of the country and society. On average, 12% of adults worldwide have inadequate basic health literacy and 35% have problematic health literacy (World Health Organization, 2013). A high level of basic literacy and cognitive development positively affects health literacy. Individuals who do not have the ability to read and write access health information at a lower rate and cannot use the information they access to make appropriate health decisions. In this direction, trying to improve the literacy status of individuals also paves the way for the development of health literacy (Nutbeam, 2000). A high level of health literacy in choosing a health institution ensures making the right decision. With increasing health literacy, individuals will not prefer a tertiary health institution for a health problem that can be solved in primary health care institutions. In this framework, unnecessary crowding will not occur in organizations providing tertiary health care services. In addition, the

ability to recognize health professionals, understand their explanations, inform them fully within the framework of health problems, and participate in the diagnosis and treatment process depends on patients' high health literacy levels. Individuals with high levels of health literacy utilize health services effectively and acquire sufficient health information. Thanks to these individuals, the costs of health services decrease, and the quality of life and the quality of health services increase (Altun, 2021). Since people with low health literacy levels do not have enough health information, their risk of health problems and hospitalization times increase, they have difficulty in understanding health professionals, and they cause an increase in healthcare costs (Çatı et al., 2018).

In a study conducted with 220 patients in the chest diseases outpatient and inpatient wards of Erbaa State Hospital in Tokat province, it was determined that the total mean score of health literacy of the patients was 50 out of 125 and the patients had limited health literacy level. In addition, it was found that the mean scores of the sub-dimensions of access, understanding, evaluation, and implementation of health literacy were also low (Şanlıtürk, 2022).

In this study, the health literacy levels of patients who applied to the Chest Outpatient Clinic of Education and Research Hospital were examined.

METHODOLOGY

It is a cross-sectional study. The study was conducted on patients who applied to the Chest Outpatient Clinic of Sultan Abdulhamid Khan Training and Research Hospital on April 14-15, 2022 and September 20-21, 2022. The data of the study on April 14-15, 2022 were presented as an oral presentation by the same researchers on May 28-29, 2022 (Kaya et al., 2022).

Research Population and Sample

The population of the study consisted of 470 patients who applied to Sultan Abdulhamid Khan Training and Research Chest Diseases Outpatient Clinic. Since 15 of the patients were illiterate, and 82 of them refused to participate in the study, the study was completed with 373 patients. The participation rate was 79.3%. Inclusion criteria were determined as being literate and completing all questionnaires. Written informed consent was obtained from the patients before starting the study.

Data Collection Tools

Data were collected by self-completion under observation. The first part of the questionnaire consists of two parts; 6 items aiming to obtain information on gender, age, education level, income status, occupation and health information sources, and the second part, HU-HLS-Long Form, consisting of 71 items (38 questions) and 16-item Self-Efficacy section was used.

Hacettepe University Health Literacy Scale (HU-HLS) Long Form: The scale has three levels of scores, 0-32: low, 33-52: medium and 53-71: high; there are two sub-dimensions as Health Protection-Promotion (HPP) and Access to Treatment-Health Services (THSS). In the HU-SOY Scale Long Form, each item is converted into a 0-1 score. In questions where the answer is asked to be indicated in a chart as "True", "False" or "Don't know", each item marked correctly is coded as 1 and the other answers are coded as 0. Cronbach's alpha for the two sub-dimensions ("disease prevention and health promotion" and "access to treatment and health services") are 0.79 and 0.91 respectively (Özvarış et al., 2018).

Ethical Aspects of the Research

Before starting the study, written permission (Date: 11.03.2022 and Board No: 9/14) was obtained from Istanbul Health Sciences University Hamidiye Scientific Research Ethics Committee. The principles of the Declaration of Helsinki were followed throughout the study.

Data Collection

The study was conducted with patients admitted to the Chest outpatient clinic in 2022. A questionnaire consisting of a sociodemographic data form and HU-HLS-Long Form questions was administered face-to-face. Patients filled out the interview form on their own under observation.

Statistical Analysis

The analysis of the research data was conducted using the IBM SPSS Statistics for Windows version 22.0 (IBM, Armonk, NY, USA) software. The normality of the data was assessed with the Kolmogorov-Smirnov test, revealing that the data

did not follow a normal distribution. Continuous variables were represented as mean ± standard deviation, while categorical variables were expressed as numbers and percentages. The Mann-Whitney U test was employed for pairwise comparisons, and the Kruskal-Wallis H test was utilized for comparisons involving more than two groups. For these larger comparisons, the Mann-Whitney U test was used in pairwise comparisons to identify specific group differences based on the test results. All statistical significance was determined at the $p<0.05$ level.

RESULTS

According to educational status, 27.3% were high school graduates and 15.3% were primary school graduates. The patients were 50.7% of male. The rate of those whose income was less than their expenses was 33%. The mean age was 43.29 years (18-82). The patients were 19% of housewives and 14.5% were workers (Table 1).

Table 1: Demographic characteristics of participants

Variables		n (%)
Gender	Female	184 (49.3)
	Male	189 (50.7)
Education Status	Literate	25 (6.7)
	Primary School	57 (15.3)
	Secondary School	49 (13.1)
	High School	102 (27.3)
	Associate degree	44 (11.8)
	Bachelor's	86 (23.1)
	Postgraduate	10 (2.7)
Income Status	Income less than expenditure	123 (33)
	Income equal to expenditure	162 (43.4)
	Income more than expenditure	88 (23.6)
Occupation	Housewife	71 (19)
	Worker	54 (14.5)
	Retired	52 (13.9)
	Officer	46 (12.3)
	Health Worker	33 (8.8)
	Tradesmen	24 (6.4)
	Unemployed	15 (4)
	Other	78 (20.9)
Age (mean ± standard deviation) (minimum-maximum)	(43.29 ± 14.67) (18-82)	

According to the HU-HLS-Long Form, 20.4% were found to have low health literacy levels (Table 2).

Table 2: Participants' level of health literacy

		n (%)
Health Literacy Level	Low	76 (20.4)
	Middle	186 (49.9)
	High	111 (29,8)

According to the gender of the patients, while there was no significant difference in access to treatment health services, total score and self-efficacy subscale dimensions, the median of the health promotion subscale dimension was higher in women than in men and was found to be statistically significant (Table 3).

Table 3: Comparison of Health Literacy Scale Scores According to Participants' Gender

	Gender	n	Median (Min-Max)	U	p	Difference
Access to Treatment Health Services	Female	188	35 (8-48)	15779.5	0.122	
	Male	191	31 (7-47)			
Health Protection Promotion	Female	188	14 (3-22)	15004	**0.022***	Male<Female
	Male	191	12 (1-21)			
Total Score	Female	188	47 (11-70)	15467.5	0.065	
	Male	191	43 (11-66)			
Self-efficacy	Female	188	38 (2-48)	17152.5	0.821	
	Male	191	38 (0-48)			

(Min: Minimum, Max: Maximum, *p<0.05)

Statistically significant differences were found in access to treatment health services, health protection development, total score and self-efficacy subscale dimensions according to the educational status of the patients (Table 4).

Table 4: Comparison of health literacy scale scores according to participants' educational background

	Education Status	n	Median (Min-Max)	H	p	Difference
Access to Treatment Health Services	Literate	25	26 (11-41)	65.080	**<0.001*** **	Literate<High School High School<Bachelor's Literate<Bachelor's Literate<Postgraduate Primary School<Bachelor's Primary School<Postgraduate Secondary School<Bachelor's Associate degree<Bachelor's
	Primary School	57	27 (8-42)			
	Secondary School	50	29 (10-43)			
	High School	106	34 (7-45)			
	Associate degree	44	33 (12-45)			
	Bachelor's	87	39 (8-48)			
	Postgraduate	10	42 (21-47)			
Health Protection Promotion	Literate	25	9 (1-16)	70.960	**<0.001*** **	Literate<Bachelor's Literate <Postgraduate Literate<Associate degree Secondary School<Bachelor's Secondary School<Postgraduate Primary School<Bachelor's Primary School<Postgraduate High School<Bachelor's High School<Postgraduate
	Primary School	57	12 (5-20)			
	Secondary School	50	11 (4-16)			
	High School	106	13 (2-22)			
	Associate degree	44	13.5 (4-20)			
	Bachelor's	87	16 (3-22)			
	Postgraduate	10	17.5 (8-21)			
Total Score	Literate	25	35 (13-57)	74.938	**<0.001*** **	Literate<High School Literate<High School Literate<Bachelor's Literate<Postgraduate Primary School<Bachelor's Primary School<Postgraduate Secondary School<Bachelor's Secondary School<Postgraduate Associate degree<Bachelor's High School<lisans
	Primary School	57	40 (15-62)			
	Secondary School	50	41 (18-58)			
	High School	106	45.5 (11-65)			
	Associate degree	44	46 (16-63)			
	Bachelor's	87	55 (11-70)			
	Postgraduate	10	59 (36-66)			
Self-efficacy	Literate	25	32 (25-48)	30.54	**<0.001*** **	Literate<Bachelor's Primary School<Bachelor's Secondary School<Bachelor's
	Primary School	57	35 (18-48)			
	Secondary School	50	37 (2-48)			
	High School	106	38 (22-48)			
	Associate degree	44	39.5 (28-48)			
	Bachelor's	87	41.5 (0-48)			
	Postgraduate	10	41 (21-47)			

(Min: Minimum, Max: Maximum, ***p<0.001)

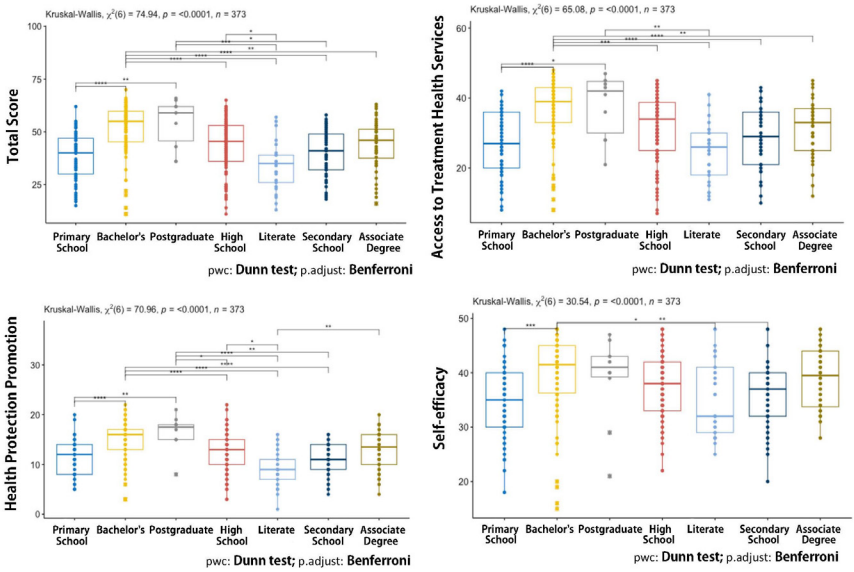

Figure 1. Within-group comparisons of participants' education levels and scale scores

No significant difference was found in access to treatment health services, health protection development, total score and self-efficacy subscale dimensions according to the income status of the patients (Table 5).

Table 5: Comparison of health literacy scale scores according to income status of participants

	Income Status	n	Median (Min-Max)	H	p	Difference
Access to Treatment Health Services	Income less than expenditure	126	32 (8-48)	0.792	0.673	
	Income equal to expenditure	165	33 (8-47)			
	Income more than expenditure	88	34 (7-47)			
Health Protection Promotion	Income less than expenditure	126	13 (1-22)	0.518	0.772	
	Income equal to expenditure	165	13.5 (3-21)			
	Income more than expenditure	88	13 (3-21)			
Total Score	Income less than expenditure	126	45 (11-70)	0.519	0.771	
	Income equal to expenditure	165	46 (11-65)			
	Income more than expenditure	88	46 (11-66)			
Self-efficacy	Income less than expenditure	126	38 (2-48)	0.394	0.821	
	Income equal to expenditure	165	38 (0-48)			
	Income more than expenditure	88	39 (15-48)			

(Min: Minimum, Max: Maximum)

Statistically significant differences were found in access to therapeutic health services, health promotion, total score and self-efficacy subscale dimensions according to the occupation of the patients (Table 6).

Table 6: Comparison of health literacy scale scores of participants according to their occupations

	Occupation	n	Median (Min-Max)	H	p	Difference
Access to Treatment Health Services	Housewife	71	33 (11-45)	37.814	<0.001***	Unemployed<Health Worker Worker<Health Worker Housewife<Health Worker Retired<Health Worker Tradesmen<Health Worker Other<Health Worker
	Worker	54	30.5 (12-44)			
	Retired	52	33 (9-46)			
	Officer	46	36 (7-47)			
	Health Worker	34	43 (11-48)			
	Tradesmen	24	32 (14-44)			
	Unemployed	15	30 (13-43)			
	Other	83	29.5 (8-45)			
Health Protection Promotion	Housewife	71	11 (5-22)	37.160	<0.001***	Unemployed<Health Worker Worker<Health Worker Housewife<Health Worker Retired<Health Worker Tradesmen<Health Worker Other<Health Worker
	Worker	54	12 (3-19)			
	Retired	52	11 (1-18)			
	Officer	46	14.5 (3-20)			
	Health Worker	34	17 (3-22)			
	Tradesmen	24	12.5 (5-18)			
	Unemployed	15	12 (5-17)			
	Other	83	13 (3-20)			
Total Score	Housewife	71	42 (16-63)	39.950	<0.001***	Unemployed<Health Worker Worker<Health Worker Housewife<Health Worker Retired<Health Worker Tradesmen<Health Worker Other<Health Worker
	Worker	54	43 (18-61)			
	Retired	52	44.5 (13-63)			
	Officer	46	50 (11-66)			
	Health Worker	34	59 (14-70)			
	Tradesmen	24	44.5 (23-62)			
	Unemployed	15	41 (18-60)			
	Other	83	42.5 (11-64)			
Self-efficacy	Housewife	71	36 (22-48)	18.150	0.012*	Housewife<Health Worker
	Worker	54	38 (24-48)			
	Retired	52	38.5 (16-48)			
	Officer	46	39 (30-48)			
	Health Worker	34	44 (0-48)			
	Tradesmen	24	37 (26-48)			
	Unemployed	15	40 (18-45)			
	Other	83	38.5 (2-48)			

(Min: Minimum, Max: Maximum, *p<0.05, ***p<0.001)

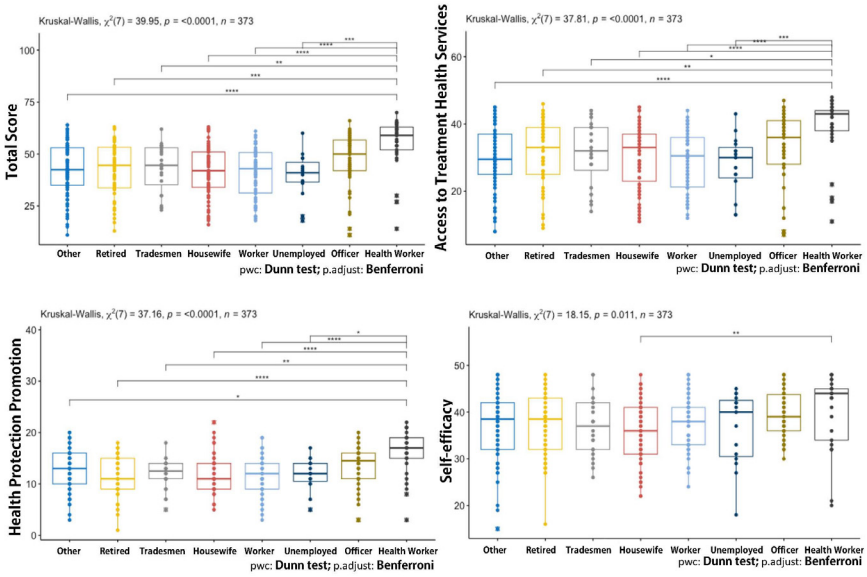

Figure 2. Within-group comparisons of participants' occupations and scale scores

DISCUSSIONS AND CONCLUSIONS

In our study, one out of every five patients had low (20.4%) and one out of every two patients had moderate health literacy. In a study conducted with 388 patients who applied to Pamukkale University Faculty of Medicine Internal Medicine Outpatient Clinic, the health literacy level was found to be insufficient (25.8%) in one out of every four patients (Çelikyürek et al., 2020). In a study conducted with 8,000 people in Austria, Bulgaria, Germany, Greece, Ireland, the Netherlands, Poland and Spain, at least one in ten participants (12%) had inadequate health literacy and one in two (47%) had limited (inadequate or problematic) health literacy (Sørensen et al., 2015). In a study conducted with 505 people in Türkiye, 22.2% had inadequate health literacy levels (Okyay & Abacıgil, 2016). Building personal health literacy skills and abilities is a lifelong process. No one is completely health literate. Even highly educated individuals may find existing health systems too complex, especially in the face of health conditions that reduce their quality of life. Capacity and competence in health literacy vary according to circumstances, culture and environment. Individuals with low health literacy often miss appointments, fail to complete registration forms, fail to administer medications, identify medications by ap-

pearance rather than reading labels, fail to give sequential medical histories and fail to follow tests or referrals (Center for Health Care Strategies, 2024). Low health literacy represents an important challenge for health policies and practices across Türkiye but to different degrees for different countries. Social change in health literacy should be taken into account when developing public health strategies to improve health equity in Türkiye.

In our study, the health protection and promotion subscale were found to be higher and statistically significant in women. In a study conducted with 259 patients admitted to the general internal medicine outpatient clinic of a training and research hospital in Istanbul, women's health literacy level was found to be higher and statistically significant (İkışık et al., 2020). In a study conducted with 759 people in the United Kingdom, the risk of having limitations in health literacy was found to be 2.04 times higher in the male gender (von Wagner et al., 2007).

In a study conducted abroad with 5,601 patients presenting to an emergency department in an urban area, inadequate health literacy was found to be 1.84 times higher in the male gender (Olives et al., 2011). Health literacy in women is seen as an important factor for health promotion and disease prevention. Health literacy affects women more than men because women use the health system more than men. As the rate of women understanding and using the necessary information about their health increases, their behaviors to prevent diseases and to provide early diagnosis of diseases also increase. Increasing the health literacy level of women will affect the health level of the whole society. Therefore, it is important that health-related documents are prepared in a language that women can understand. This will not only increase women's level of health literacy but will also help women to take responsibility and make decisions for their health (and, where necessary, the health of their children).

In our study, as the educational status of the patients increased, their health literacy levels also increased and were found to be statistically significant. In a study conducted with a total of 688 patients who applied to the internal medicine outpatient clinics of a foundation university and a state hospital, it was found to be similar to our study (Uğurlu & Akgün, 2019). In a study conducted with 225 patients who applied to the family medicine outpatient clinic of Fırat University Faculty of Medicine hospital, inadequate health literacy was

detected at high school and below education level and found to be statistically significant (Yakar et al., 2019). In a study conducted abroad with 300 patients admitted to the emergency department, limited health literacy was found to be 2.7 times higher for some high school or less compared to high school graduates (Ginde et al., 2008). Education level affects an individual's critical thinking and problem-solving skills. In addition to this, it is thought that educated individuals being responsible, communicating effectively and being more productive affect the health literacy of individuals. In a study conducted abroad with 402 patients with Type 2 diabetes, it was found that educational status was an important factor affecting health literacy (Schillinger et al., 2002). In a study conducted with 1,090 people in Istanbul during the COVID-19 pandemic period, it was determined that the frequency of having insufficient and problematic-limited health literacy decreased as the educational status of the people increased (Uçar et al., 2023).

In our study, although the health literacy score was higher in those whose income was higher than their expenses, no statistically significant relationship was found between the other income statuses. In a study conducted with 408 patients applying to the Family Health Center in Kayseri, although the rate of problematic or inadequate literacy was higher in those whose income was less than expenses, the difference was not statistically significant (Sukut, 2020). In another study conducted with 250 people in Ankara, the relationship between monthly income status and health literacy was not found to be statistically significant (Ersen, 2019). In a study conducted with 348 academic staff at Bitlis Eren University, although health literacy was higher in those whose income was higher than their expenses, no statistically significant relationship was found between them when compared with other income statuses (Kendilci, 2022). As a result, it can be thought that as the income level increases, the opportunities related to one's health increase and contribute to the increase in health literacy.

In our study, the level of health literacy in healthcare workers was found to be statistically significant and high as expected. In a study conducted in a training and research hospital in Konya province, the health literacy levels of doctors and nurses were found to be higher and statistically significant compared to permanent workers (Bükecik & Adana, 2021). In a study con-

ducted with Ankara Provincial Health Directorate employees (655 people), a statistically significant difference was found in understanding health-related information (p=0.043) and evaluating health-related information (p=0.006) from health literacy processes according to the field of graduation (health and other fields) (Al, 2021). In a study conducted with 1,199 health personnel who participated in primary health care services basic sessions of training organized by the Public Health Institution of Türkiye in order to increase the level of knowledge about the services provided, it was found that physicians had higher health literacy than auxiliary health personnel and it was statistically significant (Deniz et al., 2018). Among the activities carried out by the General Directorate of Health Promotion in the field of health literacy within the framework of the Strategic Plan of the Ministry of Health and its legislation, increasing awareness and knowledge, developing attitudes and strengthening basic skills in health literacy among health workers was also included (Ministry of Health General Directorate of Health Promotion, 2018). In a study conducted with 250 people in Ankara, the health literacy of 61.6% of those working in any income-generating job was evaluated as "adequate - excellent", and the relationship between employment status and health literacy was found to be statistically significant (Ersen, 2019).

By increasing the level of health literacy, all health institutional practices will decrease, and unnecessary medical equipment and human resources can be prevented. In a study conducted with emergency admission data from Ankara Atatürk Training and Research Hospital, it was observed that as the health literacy of patients increased, repeated visits to the emergency department decreased (Öztaş et al., 2016). High levels of health literacy in people with chronic diseases or conditions are also important for disease management (Glasgow et al., 2001). In a study conducted with 408 patients who applied to the Family Health Center in Kayseri, the rate of problematic or insufficient literacy was higher in patients with chronic diseases, and the difference was found to be statistically significant (Sukut, 2020). For health literacy, individuals are expected to be able to access health services, analyze risks and benefits, communicate with healthcare providers, evaluate information in terms of reliability and quality, interpret test results and access health-related information. In order to achieve these, individuals need to be visually literate

(able to understand graphics or other visual information), computer literate, information literate (able to acquire and apply information), numerically literate and have language skills (National Library of Medicine, 2024). Citizens, governments, civil society organizations, the media, community leaders and academic institutions have many roles to play in improving health literacy. Citizens need to play an active role in improving their own health, successfully engage in community action for health and encourage governments to fulfill their responsibilities towards health and health equity. Governments need to take a strong leadership role in the development and implementation of health literacy promotion policies by providing sustainable financing, establishing special projects, coordinating cross-sectoral actions and conducting regular health literacy surveillance.

Limitations

The study data is limited to the hospital where we obtained the data. It cannot be generalized to the whole population. It is recommended to be conducted in health institutions and polyclinics at different levels.

Ethical Approval: Istanbul Health Sciences University Hamidiye Scientific Research Ethics Committee (Date: 11.3.2022 and Board No: 9/14).

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Navigating Public Health Services: Personal Connections vs. Bribes in the Northern Part of Cyprus

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ABSTRACT

This study examines the prevalence and dynamics of bribery versus the utilization of personal connections in accessing public health services by conducting a statistical analysis based on survey data from the northern part of Cyprus. The findings reveal that personal connections are more commonly used than bribery, with 74% of respondents using connections compared to 17% paying bribes. The study uncovers a complementary relationship between these practices, indicating that they often coexist rather than substitute for each other. Regression analysis highlights significant demographic factors influencing engagement in these practices, such as gender, socioeconomic status, and migration status. Vulnerable groups, including females, the poor, and immigrants, are disproportionately involved in bribery. Education emerges as a significant factor positively impacting both bribery and personal connections, while age shows differential effects on these practices. This study improves the understanding of the intricate dynamics of informal channels in accessing public health services and emphasizes the need for targeted policy interventions to address these complexities and ensure equitable access for all segments of society.

Keywords: Bribes, Corruption, Cyprus, Personal Connections, Public Health

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INTRODUCTION

Bribery, corruption, and the exploitation of personal connections within public services create substantial obstacles, significantly impacting economic growth, governance, equity, and the efficacy of public service delivery (Mauro, 1995; Gupta et al., 2002; Ivanyna et al., 2016; Dimant & Tosato, 2017; Machoski & de Araujo, 2020). These issues are particularly problematic in public health services, as they worsen both mental and physical health (van Deurzen, 2017; Achim et al., 2020; Sharma et al., 2021), increase mortality rates, reduce life expectancy and immunization rates, and delay vaccinations of newborns (Azfar & Gurgur, 2008; Li et al., 2018).

Bribery, which encompasses the offering, giving, receiving, or soliciting of something of value to influence the actions of officials or individuals in positions of power, serves as a means to expedite processes, secure favorable outcomes, or gain access to services (Olken & Pande, 2012). Conversely, the utilization of personal connections involves individuals leveraging familial ties, friendships, or other personal networks to secure advantages or preferential treatment in public services (Makovicky & Henig, 2018).

In many instances, bribery and the use of personal connections are intricately linked and coexist, posing dual threats to the principles of transparency, fairness, and equal access to public services (de Jong et al., 2015). Notably, vulnerable groups, such as those in poverty or belonging to certain racial and ethnic minorities, face an elevated risk of corruption (Mhazo & Maponga, 2022). For example, in the realm of public health, evidence suggests regressive payments, with impoverished patients bearing a disproportionately higher burden (Shabbir & Anwar, 2007; Rispel et al., 2016). Contrary to the notion that payment levels depend on a patient's ability to pay, research challenges this idea, demonstrating similar payment sizes across income groups in Hungary, with payment amounts more influenced by willingness to pay in transition economies. This underscores the regressive nature, as the poorest may exhibit a greater willingness to pay due to restricted healthcare access (Azfar & Gurgur, 2008; Gokcekus, 2024).

Importantly, members of vulnerable groups, by definition, lack the ability to leverage personal connections, as they do not have the connections or relationships necessary to gain advantages or preferential treatment in public services.

Considering these intertwined challenges, this study aims to unveil the prevalence and interconnection between bribery and the exploitation of personal connections in accessing public health services. Furthermore, it seeks to shed light on potential variations among diverse demographic groups. Specifically, the study raises the following three research questions: 1) Which is more prevalent in public health services: bribery or the use of personal connections? 2) Do bribery and the use of personal connections go hand in hand, or is it the other way around? 3) Are certain demographics more likely to engage in bribery, while others are prone to exploiting personal connections for preferential treatment in public services?

The motivation behind this study stems from the unique socio-political and economic context of the northern part of Cyprus, an area characterized by its unrecognized status and the resulting challenges in governance and public service delivery (Ker-Lindsay, 2011). Unlike the southern part of Cyprus and other EU countries, the northern part of Cyprus operates under distinct administrative and socio-economic conditions, making it a compelling case for examining corruption dynamics in public health services. This study aims to fill a critical gap in the literature by focusing on the dual phenomena of personal connections and bribery, two prevalent but often interlinked mechanisms through which individuals navigate the healthcare system. Unlike previous research that typically examines these practices in isolation, our study explores their coexistence and interplay, offering a more nuanced understanding of corruption in public health access. Additionally, the use of a comprehensive survey method tailored to capture the specific experiences and practices within the northern part of Cyprus provides novel insights into how demographic factors influence these behaviors. Our findings, which reveal significant demographic disparities and a complementary relationship between personal connections and bribery, contribute original knowledge to the field and suggest targeted policy interventions to promote equitable healthcare access. This study not only advances the academic discourse on corruption and informal practices but also has practical implications for improving governance and transparency in public health systems.

LITERATURE SURVEY

The use of social connections and payment of bribes is a convenient way for the average person to circumvent both market inefficiencies and governmental red tape, gaining a comparative advantage over their counterparts in their social class. Informal economic practices appear to be an innate facet of human interaction and a social adaptation for citizens to cope with the impersonal norms of modern economies (de Paiva, 2018). For instance, in many current or former communist countries, informal economic practices developed out of necessity to avoid state control and allocate resources more efficiently.

The healthcare sector is particularly vulnerable to informal economic practices due to the uncertainty and inelasticity of its demand, as well as the sheer number and diffusion of its providers (Vian, 2008). Given the circumstances surrounding the demand for healthcare, there is a need for a method to quickly gain access when medical emergencies arise. Because of the complications in healthcare provision, there are many opportunities for informal transactions.

Whether bribes or personal favors are more commonly used in healthcare services is a debated topic. The Global Corruption Barometer – Asia found that personal connections were more commonly used (Vrushi, 2020). However, the need for instant reciprocity in medical emergencies may necessitate the use of bribes. What determines if a society will use bribes or connections depends on various cultural factors. One factor is the level of societal kinship present in the country. Societies with tighter-knit communities, where people are more interconnected, tend to prefer connections over bribes. These societies place importance on family connections, which encourages favoritism (Akbari et al., 2019). This trend is more pronounced in relatively small and recently urbanized countries (Aliyev, 2018; Otten, 2018). In such societies, clan or family ties lead to more connections being used to gain an advantage (Sayfutdinova, 2018; Turaeva, 2018). In general, stronger social ties seem to increase the prevalence of favoritism (Zheng et al., 2020), supporting the idea that the type of economic system in a country affects the use of favors versus bribes.

As previously mentioned, in communist countries, favors were used to circumvent state control. However, as countries undergo economic transitions, the types of informal economic practices also change. China, Cuba, Russia, and many former members of Yugoslavia all illustrate this effect (Ledeneva, 2018;

Cherneski, 2018). With some elements of capitalism and the permission of private enterprise, the profit motive has expanded, and reciprocity has become more immediate. Thus, the use of direct monetary exchanges in the form of bribes has become more commonplace (Yang, 2018).

Gender may also play a role in shaping the prevalence of bribery and interpersonal connections. For example, women often prioritize "helping" behavior and emphasize the public interest, leading them to endorse ethical conduct more frequently and engage in illicit economic activities less often (Dollar et al., 2001). Additionally, women holding prominent positions in bureaucratic roles tend to experience lower levels of corruption (Swamy et al., 2001; Frank et al., 2011).

Another factor affecting the use of favors and bribes is class differences. Many of the social connections needed to give favors are formed in middle- and upper-class environments such as internships, fraternities, or university alumni associations (Kubbe, 2018). Social favors are typically used to gain mid- to lower-level bureaucratic positions, place one's children in better schools, or sidestep administrative roadblocks to small businesses. Middle-class workers largely fill these administrative positions, providing necessary services that can be expedited with a well-placed connection. Lower-class, blue-collar workers largely do not fill these roles and can typically only offer their manual labor to their peers. Additionally, members of the lower class do not have the resources to pay bribes to attain the same services and cannot achieve the same levels of social mobility. Members of the upper class are also less likely to use favors because it would betray their own class sensibilities and concede social equality with the middle class (Lomnitz, 2018).

DATA AND METHOD

To conduct the analyses, micro-data obtained from a survey conducted in the northern part of Cyprus between November and December 2021 were utilized.[2] The survey design closely followed Transparency International's Global Corruption Barometer surveys conducted in EU countries, ensuring comparability of results (Sonan & Gokcekus, 2022). The survey included three key questions: "Did you utilize public health services in the past year?", "Have you ever resorted to bribery, gifts, or favors to access necessary services at a public hospital or health institution? If yes, how often?", and "Did you rely on personal connections to access services at a public hospital or health institution? If yes, how often?"

Metron Analytics Services, a local survey firm in Nicosia, administered the survey using the computer-assisted telephone interviewing (CATI) method. This approach involved contacting participants via telephone and recording their responses directly into a computer system, thereby enhancing accuracy and efficiency. The sample comprised 1,000 participants aged 18 and above, randomly selected from the official voter registry, which includes all citizens over 18 years of age. This registry serves as a reliable source, ensuring a representative sample of the population: Given that the official electorate count was 198,624 in the 2020 elections, the survey was designed to achieve a significance level of 0.05 and a margin of error of ±3.1%, ensuring the results are statistically reliable. Additionally, the random sample was stratified to ensure proportional representation across various demographic segments, including age groups, gender, and residential areas, to accurately capture the diversity of the population.

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2 The Republic of Cyprus, established in 1960 as a power-sharing arrangement between the majority Greek Cypriots and the minority Turkish Cypriots, was divided in 1974 by Turkey's invasion. In the northern part of the island, the Turkish Cypriots formed the Turkish Federated State of Cyprus (TFSC) in 1975. Despite efforts at unification, negotiations stalled, leading to the unilateral declaration of independence by Turkish Cypriots in 1983, creating the Turkish Republic of Northern Cyprus (TRNC), recognized solely by Turkey. Cyprus joined the EU in 2004, and since the Republic of Cyprus is recognized by the international community as the sole government on the island, the entire island is considered an EU member state. However, under the Protocol 10 of the Accession Treaty, the EU acquis communitaire is suspended in the northern part of the island until a political solution is found. (For details, see Ker-Lindsay, 2011.) This political status quo also affects global assessments, as the northern part of the island is not included in most of the international surveys, including the global corruption barometer and corruption perception index reports.

Table 1 provides summary statistics for key variables related to the frequency of bribe payments, the frequency of using personal connections, demographic characteristics, and socioeconomic status among 497 individuals in our dataset who utilize public health services. Bribe payments, measured on a scale of 1 to 5 (1 = never, 2 = once or twice, 3 = more than once or twice, 4 = very often, and 5 = don't know), have a mean of 1.378 (SD = 1.001). Personal connections, ranging from 1 to 6 (1 = never, 2 = once or twice, 3 = more than once or twice, 4 = very often, 5 = don't know, and 6 = no answer), show a mean of 2.473 (SD = 1.276). Age, on a scale from 1 to 6 (1 for 18-24, 2 for 25-34, 3 for 35-44, 4 for 45-54, 5 for 55-64, and 6 for 65 and above) has a mean of 3.059 (SD = 1.383). Education levels, ranging from 1 to 5 (for elementary school 1, middle school 2, high school 3, university 4, master's and doctorate 5), have a mean of 2.915 (SD = 0.883). The data also indicates that 14.1% of participants are migrants (1 = those who were not born in Cyprus, 0 = otherwise), with females comprising 48.7% of the sample. Additionally, 32.8% of respondents are classified as poor (1 = those who were either 'barely getting by', "need to borrow to purchase the things they need' or 'can't afford to buy anything they need, and 0 = otherwise), while the majority (61.2%) reside in urban areas.

Table 1: Summary statistics

Variable	Obs	Mean	Std. dev.	Min	Max
Bribe payments	497	1.378	1.001	1	5
Personal relations	497	2.473	1.276	1	6
Age	495	3.059	1.383	1	6
Education	497	2.915	0.883	1	5
Migrant	497	0.141	0.348	0	1
Female	485	0.487	0.500	0	1
Poor	488	0.328	0.470	0	1
Living in city	497	0.612	0.488	0	1

Based on survey results from the northern part of Cyprus, the brief literature survey, and in line with the three questions raised earlier, the study puts forward the following three sets of testable hypotheses:

H_{01}: There is no significant difference in prevalence between bribery and the use of personal relations in accessing public health services.

H_{11}: The prevalence of bribery is significantly different from the use of personal relations in accessing public health services.

H_{02}: There is no association between bribery and the use of personal relations in accessing public health services.

H_{12}: Bribery and the use of personal relations are significantly associated in accessing public health services, indicating they either go hand in hand (complementary) or it is either or (substitutes) rather than being independent of each other.

H_{03}: There is no significant difference in demographic groups regarding their likelihood to engage in bribery or exploit personal relations for preferential treatment in public services.

H_{13}: Certain demographics, i.e., vulnerable groups such as females, the poor, and immigrants, are significantly more likely to engage in bribery compared to exploiting personal relations for preferential treatment in public services.

To test the first hypothesis, a z-test was employed to compare the mean differences between paired observations of using personal connections and paying bribes. This test helps determine whether there is a statistically significant difference in the frequency of these two practices among respondents. Specifically, the z-test evaluates the null hypothesis that there is no difference in the prevalence of bribery and the use of personal connections, against the alternative hypothesis that a difference does exist.

For the second hypothesis, a contingency table was constructed to examine the relationship between the frequency of bribe payments and the frequency of using personal relations to access public health services. This table provides a cross-tabulation of the two variables, allowing for the identification of patterns and associations. The relationship was further analyzed by calculating chi-square statistics to test for independence and Cramer's V to measure the strength of the association. These statistical measures help to determine whether the use of personal connections and the payment of bribes are inde-

pendent behaviors or if they are associated, indicating either a complementary or substitutive relationship.

Finally, to test the third hypothesis, relevant coefficients were estimated and compared from two ordered logistic regression models. These models assess the frequency of bribe payments and the use of personal connections based on various demographic factors of health service users, such as age, gender, education level, migrant status, economic status, and urban versus rural residency. The ordered logistic regression allows for the estimation of the probability of different levels of engagement in bribery and personal connections, taking into account the ordinal nature of the dependent variables. By comparing the coefficients, the analysis identifies which demographic factors significantly influence the likelihood of engaging in these informal practices, providing insights into the sociodemographic determinants of corruption in public health access.[3]

FINDINGS

Are Bribes or Personal Connections Used More Frequently?

The hypothesis that there is no difference in the frequency of paying bribes and using personal connections to access public health services is tested by utilizing two different data sets. First, the responses to relevant questions are re-coded: unless a respondent selects 'never,' they are coded as having paid bribes (bribe pay = 1, otherwise 0) and as having used connections (connection = 1, otherwise 0) to access public health services. The decision to code 'don't know' and 'no answer' responses as indicative of engaging in bribery payments and using personal connections is based on recognizing respondents' potential reluctance to disclose involvement in undesirable or illegal activities, especially in smaller societies. The re-coding indicates that 74% of the respondents reported using personal connections, while 17% admitted to paying bribes. The z-test result compares the mean difference between paired observations

3 The equation for an ordered logistic regression model, is expressed as logit $(P(Y \leq j)) = \alpha_j + \beta_1 X1 + \beta_2 X2 + \ldots + \beta_p Xp + \epsilon$, where $P(Y \leq j)$ signifies the probability that the dependent variable Y falls into or below category j, with j ranging from 1 to j–1 categories, and j representing the total number of categories. The logit function, logit(·), computes the natural logarithm of the odds, while α_j is the intercept specific to category j. The coefficients $\beta_1, \beta_2, \ldots, \beta_p$ correspond to the independent variables X1, X2, ..., Xp, and ϵ accounts for the error term, capturing unexplained variability in the dependent variable (Long, 1997).

of 'connection' and 'bribe pay.' The mean difference is 0.565 (SD = 0.026). The calculated z-value is 484.79 ($p<0.01$), indicating a significant difference between the paired means of 'connection' and 'bribe pay.' This suggests a substantial and statistically significant difference between the frequency of bribe payments and using connections to access public health services. Second, to test the hypothesis that there is no difference in the frequency of paying bribes and using personal connections to access public health services, 'don't know' and 'no answer' responses are excluded. Doing so indicates that 72% of the respondents used personal connections, while 12% paid bribes. For the mean difference of 0.590, the calculated z-value is 484.50 ($p<0.01$), indicating a significant difference. Both test results suggest a substantial and statistically significant difference between the frequency of bribe payments and the use of connections to access public health services.

Do Paying Bribes and Using Personal Connections Go Hand in Hand?

The contingency table in Table 2 illustrates the relationship between bribe payments and the frequency of using personal relations to access public health services, in a more detailed manner. A significant association is evident, as indicated by a chi-square value of 197.92 ($p<0.01$) and Cramer's V of 0.32. The table shows that individuals who report 'very often' using personal relations for accessing health services are more likely to have made bribe payments. Conversely, those who report 'never' using personal relations for such purposes have the highest count in the 'Never' bribe payment category. The table highlights a clear pattern: as the frequency of using personal relations increases, so does the incidence of bribe payments, underscoring the interconnectedness between these variables in navigating public health services.

Table 2: Contingency table of bribe payments and using personal connections for accessing public health services

	BRIBE PAYMENTS					
PERSONAL CONNECTIONS	**Never**	**Once or twice**	**More than once or twice**	**Very often**	**No answer**	**Total**
Never	125	4	0	0	2	131
Once or twice	153	9	1	0	4	167
More than once or twice	49	14	1	0	3	67
Very often	71	15	8	6	6	106
No answer	6	0	0	0	11	17
Don't know	8	0	0	0	1	9
Total	412	42	10	6	27	497
	$\chi^2 197.92 = ^2 (p<0.01)$ Cramer's V = 0.32					

Figure 1 further demonstrates the association between bribe payments and using personal relations to access public health services. The presented findings reveal a strong association between the frequency of utilizing personal relations in accessing public health services and the propensity to engage in bribery. Among respondents who reported 'never' employing personal connections, a substantial 95% affirmed 'never' participating in bribery. Similarly, those who utilized personal connections 'once or twice' exhibited a high likelihood of 92% in refraining from bribery. However, as the frequency of using personal connections increased, a gradual reduction in the likelihood of never engaging in bribery was observed. Specifically, individuals employing personal relations 'more than once or twice' and those using them consistently ('very often') reported percentages of 73% and 67%, respectively, indicating a decreased likelihood of abstaining from bribery compared to the lower frequency categories. This nuanced exploration underscores the interplay between personal relations in health service utilization and the corresponding patterns of bribery engagement.

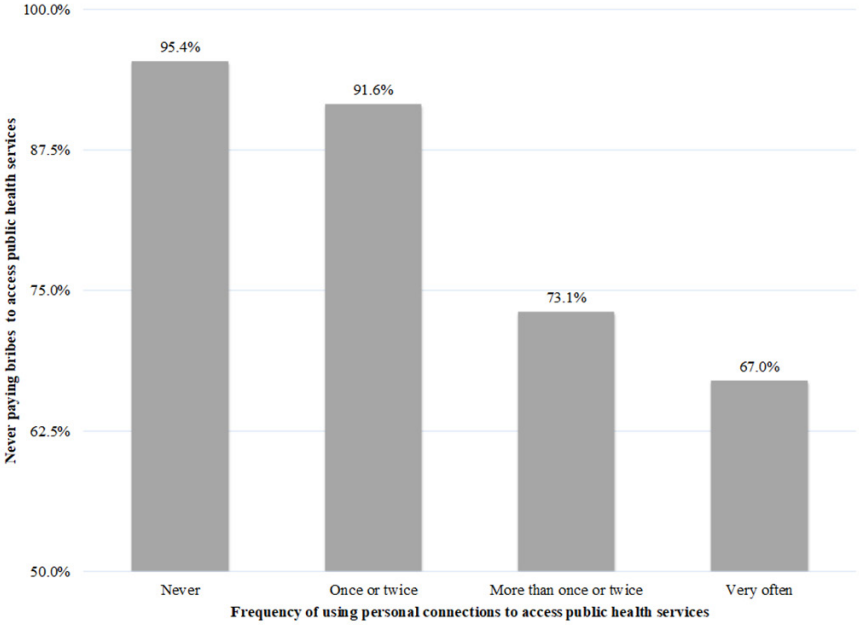

Figure 1. Frequency of using personal connections and "Never" paying bribes to access public health services

Are Different Groups Utilizing Bribe Payments and Personal Connections Differently?

In examining the determinants of frequency of bribe payments and using personal connections in accessing public health services, ordered logistic regression models with the same explanatory variables were employed. As is presented in Table 3, for both models, statistically significant likelihood ratio chi-square tests (LR χ^2 = 23.41, p-value=0.001 for 'Bribe Payments'; LR χ^2 = 32.16, p-value=0.001 for 'Personal Connections'), underscores the robustness of the estimation results.

Table 3: Ordered logit regression results – dependent variables 'Bribe Payments' and 'Personal Connections'

	Bribe Payments				Personal Connections			
Explanatory Variables	**Coefficient**	**Std. error**	**z**	**P > z**	**Coefficient**	**Std. error**	**z**	**P > z**
Age	-0.073	0.10	-0.74	0.459	-0.187	0.06	-2.96	0.003
Education	0.193	0.15	1.28	0.199	0.328	0.10	3.23	0.001
Migrant	0.650	0.32	2.02	0.043	0.033	0.24	0.14	0.891
Female	0.675	0.26	2.58	0.010	0.194	0.17	1.13	0.259
Poor	0.963	0.27	3.62	0.000	0.601	0.19	3.24	0.001
Living in city	0.198	0.26	0.76	0.450	-0.185	0.17	-1.08	0.280
/cut1	2.930	0.68		1.594	-0.504	0.44		-1.375
/cut2	3.794	0.70		2.430	1.036	0.45		0.158
/cut3	4.128	0.70		2.751	1.690	0.45		0.802
/cut4	4.340	0.71		2.952	3.743	0.50		2.768
No. of Obs.	477				477			
LR $x^2(7)$	23.41			0.001	32.16			0.001
Log likelihood	-292.14				-692.64			

The analysis of estimated coefficients of the explanatory variables in the ordered logistic regression models reveals nuanced relationships regarding bribe payments and personal connections. Age exhibits contrasting effects: while its coefficient of -0.073 (SE = 0.10) in the 'Bribe Payments' model implies a slight decrease in the log odds of higher bribe payments per year, this change is not statistically significant (z = -0.74, p-value=0.459). Conversely, in the 'Personal Connections' model, the coefficient of -0.187 (SE = 0.06) indicates a significant negative impact of age on personal connections (z = -2.96, p-value=0.003).

Education consistently shows a positive influence. In the 'Bribe Payments' model, its coefficient of 0.193 (SE = 0.15) suggests an increase in the log odds of higher bribe payments with each education level, although it is not statistically significant (z = 1.28, p-value=0.199). However, in the 'Personal Connections'

model, the coefficient of 0.328 (SE = 0.10) indicates a significant positive effect of education on personal connections (z = 3.23, p-value=0.001). Migrant status significantly increases the likelihood of higher bribe payments (coefficient = 0.650, SE = 0.32, z = 2.02, p-value=0.043) but does not impact personal connections significantly (z = 0.14, p-value=0.891). Females are more likely to engage in both bribe payments (coefficient = 0.675, SE = 0.26, z = 2.58, p-value=0.010) and personal connections (coefficient = 0.194, SE = 0.17, z = 1.13, p-value=0.259), although the effect is only significant for bribe payments. Individuals classified as poor exhibit a strong positive association with both bribe payments (coefficient = 0.963, SE = 0.27, z = 3.62, p-value=0.000) and personal connections (coefficient = 0.601, SE = 0.19, z = 3.24, p-value=0.001). Living in a city does not significantly affect either bribe payments (z = 0.76, p-value=0.450) or personal connections (z = -1.08, p-value=0.280).

To further compare and contrast the marginal impacts of demographic and socioeconomic factors on whether individuals pay bribes and use personal connections, average marginal effects (Delta-method dy/dx) were derived. Figure 2 presents the average marginal effects of different factors on whether someone "never uses personal connections" or "never pays bribes." For instance, on average, moving from one age category to the next increases the likelihood of never using personal connections by 0.035. However, age doesn't have a significant impact on whether someone avoids paying bribes, with an average increase of only 0.010. Higher levels of education lead to a decrease in the likelihood of never using personal connections, with each education level reducing this probability by 0.061 on average. Similarly, education has a negative effect on never paying bribes, lowering the likelihood by 0.025, although this effect is not statistically significant.

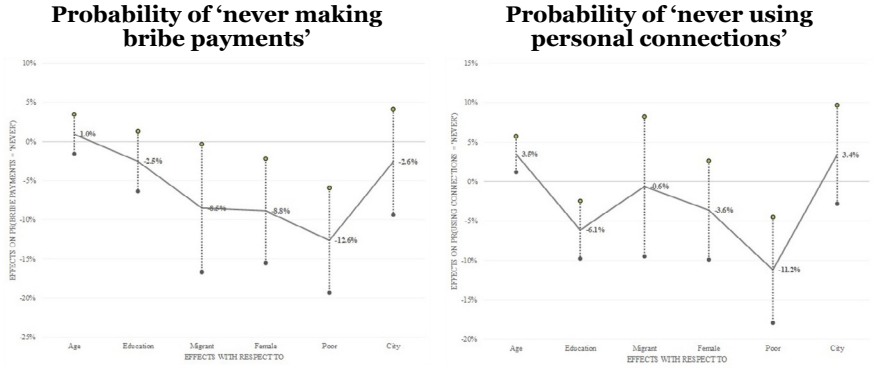

Figure 2. Average marginal effects (Delta-method dy/dx) on probability of 'never making bribe payments' and probability of 'never using personal connections' with 95% confidence intervals

Being a migrant has a negligible average impact on never using personal connections, decreasing the likelihood by 0.006. However, it significantly decreases the likelihood of never paying bribes, with an average reduction of 0.085 compared to non-migrants.

On average, being female decreases the likelihood of never using personal connections by 0.036. Similarly, it has a significant negative effect on never paying bribes, reducing the likelihood by 0.088 compared to males. Individuals classified as poor also experience a substantial decrease in both outcomes. Being classified as poor reduces the likelihood of never using personal connections by 0.112 on average and decreases the likelihood of never paying bribes by 0.126.

Living in a city has a minor impact on both outcomes. On average, it increases the likelihood of never using personal connections by 0.034 and decreases the likelihood of never paying bribes by 0.026, although these effects are not statistically significant.

The following table, Table 4 provides a concise summary of the hypotheses, the statistical tests used to evaluate them, the results of those tests, and whether each hypothesis was supported by the data.

Table 4: Summary of the hypotheses, statistical test, and results

Hypothesis	Statistical Test Used	Result (p-value, effect size)	Supported (Yes/No)
H01: There is no significant difference in prevalence between bribery and the use of personal relations in accessing public health services.	Z-test	Mean difference = 0.565, SD = 0.026, Z = 484.79, $p<0.01$	No
H02: There is no association between bribery and the use of personal relations in accessing public health services.	Chi-square test	$x^2 = 197.92$, $p<0.01$, Cramer's V = 0.32	No
H03: There is no significant difference in demographic groups regarding their likelihood to engage in bribery or exploit personal relations for preferential treatment in public services.	Ordered logistic regression	Age: Coef = -0.073, p=0.459 (Bribe); Coef = -0.187, p=0.003 (Connections); Education: Coef = 0.193, p=0.199 (Bribe); Coef = 0.328, p=0.001 (Connections); Migrant: Coef = 0.650, p=0.043 (Bribe); Coef = 0.033, p = 0.891 (Connections); Female: Coef = 0.675, p=0.010 (Bribe); Coef = 0.194, p=0.259 (Connections); Poor: Coef = 0.963, p=0.000 (Bribe); Coef = 0.601, p=0.001 (Connections); City: Coef = 0.198, p=0.450 (Bribe); Coef = -0.185, p=0.280 (Connections)	No for Age (Bribe), Yes for Age (Connections); No for Education (Bribe), Yes for Education (Connections); Yes for Migrant (Bribe), No for Migrant (Connections); Yes for Female (Bribe), No for Female (Connections); Yes for Poor (Bribe and Connections); No for City (Bribe and Connections)

DISCUSSION

The findings of this study illuminate the complex dynamics surrounding bribery and the exploitation of personal relations in accessing public health services. The analysis aimed to address three key research questions: the prevalence of bribery versus the use of personal relations, the association between bribery and personal connections, and the influence of demographic factors on engagement in these practices.

Firstly, the study reveals a significant difference in the frequency of bribery payments compared to the use of personal connections: a substantial majority of respondents (72%) resorted to personal connections to access public health services, while only 12% reported paying bribes. This stark contrast suggests that personal connections are more prevalent than bribery in navigating public health services in the northern part of Cyprus. These findings align with previous research indicating that social networks play a critical role in accessing

services in regions with weak formal institutions (Akbari et al., 2019; Zheng et al., 2020). However, they also contrast with studies from other contexts where bribery is more prevalent, highlighting the unique socio-political environment of the northern part of Cyprus (Azfar & Gurgur, 2008; Ledeneva, 2018).

Moreover, as summarized in Table 5, these frequencies differ significantly from what is observed in the southern part of Cyprus and in the EU (Kukutschka, 2021). When comparing the prevalence of using personal connections to access public health services, the study found that 72% of respondents in the northern part of Cyprus resorted to personal connections, whereas in the southern part of Cyprus, this figure was significantly lower at 27% and in the EU, it stood at 29% (Kukutschka, 2021). This substantial difference indicates a much higher reliance on personal relations in the northern part of Cyprus compared to the southern part of Cyprus and the broader EU context. These findings suggest that social networks and personal ties play a crucial role in navigating public health services in the northern part of Cyprus, consistent with theories on social capital and network-based access to services (Aliyev, 2018).

Table 5: The northern part of Cyprus compared to the southern part of Cyprus and the EU*

	Northern part of Cyprus	Southern part of Cyprus	EU
Didn't pay bribe or used personal relations	27%	75%	71%
Paid bribe or used personal relations	73%	25%	29%
Paid bribes	12%	3%	6%
Used personal relations	72%	27%	29%

* Base: People that came into contact with the service, excluding missing responses.
Source: Author's calculations and Kukutschka, 2021.

Shifting focus to the frequency of paying bribes, the analysis revealed that 12% of individuals in the northern part of Cyprus reported paying bribes to access public health services, while in the southern part of Cyprus, this figure was notably lower at 3% and in the EU, it stood at 6% (Kukutschka, 2021).

Although both Cyprus regions and the EU show instances of bribery payments, the northern part of Cyprus exhibits a higher prevalence of this practice compared to the southern part and the EU average. This disparity underscores the challenges and complexities associated with corruption and informal payments within the healthcare system in the northern part of Cyprus. Studies have shown that higher levels of corruption are often associated with weaker governance and economic instability, which may contribute to the higher prevalence of bribery in the northern part of Cyprus (Mauro, 1995; Vian, 2008).

Secondly, the analysis highlights a strong association between the frequency of utilizing personal relations and engaging in bribery. Among respondents who reported "never" employing personal connections, a substantial 95% affirmed "never" participating in bribery. Similarly, those who utilized personal connections "once or twice" exhibited a high likelihood of 92% in refraining from bribery. However, as the frequency of using personal connections increased, a gradual reduction in the likelihood of never engaging in bribery was observed. Specifically, individuals employing personal relations "more than once or twice" and those using them consistently ("very often") reported percentages of 73% and 67%, respectively, indicating a decreased likelihood of abstaining from bribery compared to the lower frequency categories. The contingency table and chi-square analysis support this pattern, demonstrating a clear trend where the frequency of using personal relations correlates with a higher propensity for engaging in bribery. These findings indicate a complementary relationship between these practices where individuals who frequently leverage personal connections are also more inclined to resort to bribery. This relationship is supported by literature on the dual nature of informal practices, suggesting that individuals often use multiple strategies to navigate systemic barriers (de Jong et al., 2015; de Paiva, 2018).

Thirdly, demographic factors play a significant role in shaping engagement with bribery and personal connections. The regression analysis reveals several noteworthy findings. Age exhibits contrasting effects with no significant impact on bribery but a significant negative influence on personal connections, suggesting that younger individuals are more likely to utilize personal relations. This finding is consistent with research showing that younger individuals may rely more on social networks due to limited financial resources (Frank et

al., 2011). Education level positively correlates with both bribery and personal connections, although the effect is more pronounced for personal connections. This indicates that higher education levels may increase one's social capital, facilitating the use of personal connections (Dollar et al., 2001; Swamy et al., 2001). Migrant status and gender also show significant associations, with migrants and females being more likely to engage in both practices. Furthermore, individuals classified as poor exhibit a strong positive association with bribery and personal connections, indicating that socioeconomic status influences engagement in these informal economic practices. These results align with studies highlighting the vulnerability of economically disadvantaged groups to corruption and their reliance on informal practices to access services (Rispel et al., 2016; Sharma et al., 2021).

The findings of this study have significant theoretical implications for understanding informal economic practices across different cultural and socioeconomic contexts. By revealing the complementary relationship between bribery and personal connections in accessing public health services, the study challenges the conventional view that these practices are mutually exclusive. This insight suggests that in environments where formal institutions are weak or inefficient, individuals may simultaneously engage in multiple informal practices to navigate systemic barriers. The differential impact of demographic factors such as gender, socioeconomic status, and migrant status further highlights the role of social capital and networks in shaping access to public services. In tighter-knit communities where social ties are stronger, personal connections may be more prevalent, while in more fragmented or recently urbanized societies, bribery may become a more common strategy. These findings underscore the importance of considering the cultural and socioeconomic context when analyzing informal economic practices (Makovicky & Henig, 2018; Yang, 2018). They also suggest that policy interventions need to be context-specific, addressing the unique social dynamics and institutional weaknesses of each setting to effectively combat corruption and promote equitable access to services. This study contributes to a more nuanced understanding of how informal economic practices operate and interact within diverse environments, providing a foundation for future research to explore these complex relationships further.

The practical implications of these findings are crucial for policymakers and public health administrators. Understanding that personal connections and bribery often coexist and are influenced by various demographic factors can help in designing more effective anti-corruption strategies. Targeted interventions should be developed to address the specific needs and vulnerabilities of different demographic groups, such as migrants, females, and economically disadvantaged individuals. For instance, strengthening social capital in communities with weaker social ties may reduce the reliance on bribery. Additionally, policy measures that enhance transparency and accountability in public health services can mitigate the opportunities for informal practices. Public awareness campaigns that educate citizens about the negative impacts of bribery and favoritism, combined with institutional reforms that streamline bureaucratic processes, can foster a culture of ethical conduct and equitable service delivery (van Deurzen, 2017; Vrushi, 2020).

CONCLUSION

In general, informal economic practices are ways for people to cope with a scarcity of resources and opportunities. Whether this scarcity stems from poverty or systemic mismanagement, necessity drives individuals to find ways to obtain the goods and services they need. Although bribery is a more overt form of corruption, the use of personal connections also grants individuals a distinctly unfair advantage in navigating bureaucratic red tape. The presence of these practices in any form runs counter to the liberal concept of meritocracy. In practice, they can erode public trust in institutions and even put a strain on the process of democracy (Ariely & Uslaner, 2017; Vrushi, 2020).

The findings in this study underscore the interconnectedness and complexity of bribery and personal connections in accessing public health services. While personal connections may serve as means of navigating bureaucratic hurdles and gaining preferential treatment, they also create conditions conducive to bribery. Vulnerable groups, including migrants, females, and the economically disadvantaged, are particularly susceptible to engaging in these practices, highlighting the need for targeted interventions and policy measures to address corruption and ensure equitable access to public services.

This study improves the understanding of informal economic practices and their implications for governance, transparency, and service delivery in public health services. While it provides valuable insights, it is not without limitations. The focus on the northern part of Cyprus may limit the generalizability of the findings, and the reliance on self-reported data introduces potential biases. Addressing these weaknesses and building upon the study's findings would contribute to a more comprehensive understanding of informal economic practices and their implications for governance, transparency, and service delivery in public health services.

Future studies could deepen the understanding and address gaps in the literature. Exploring the relationship between personal connections and bribery could provide insights into decision-making in public health services. Comparative studies across different settings and countries, as well as longitudinal studies, could reveal factors shaping engagement with informal economic practices. Addressing these challenges requires a comprehensive approach that combines regulatory measures, institutional reforms, and public awareness campaigns to foster transparency, accountability, and ethical conduct in public service delivery.

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Unraveling the Environmental, Meteorological and Lifestyle Determinants of Hypertension Mortality in Türkiye

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Özgenç AKTAŞ KOÇAK[2]

ABSTRACT

Hypertension is a leading risk factor for cardiovascular diseases and a significant cause of mortality worldwide. This study investigates the association of environmental, meteorological, and lifestyle factors with hypertension mortality in Türkiye from 2010 to 2019. This study analyzed province-level hypertension mortality data for 81 provinces in Türkiye from 2010 to 2019. Predictors included air quality indicators (particulate matter 10, sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone), meteorological variables (air pressure, humidity, temperature, wind speed), and lifestyle factors (smoking, alcohol consumption, exposure to second-hand smoke). An ordinal logistic regression approach was employed to model the likelihood of hypertension mortality, with adjustments for multiple testing using the Benjamini-Hochberg False Discovery Rate technique. In this study, it was found that significant associations are between hypertension mortality and several predictors. Air pressure, in terms of coefficient of variation and median levels, was significantly associated with hypertension mortality. Temperature and humidity showed strong associations, with median levels and variability impacting mortality rates. Lifestyle factors, notably smoking and alcohol consumption, were also significantly associated with increased hypertension mortality. Surprisingly, exposure to

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smoke at home showed a slight protective effect. The study highlights the complex interplay of environmental, meteorological, and lifestyle factors in terms of influencing hypertension mortality in Türkiye. These findings emphasize the need for multifaceted public health strategies that consider these diverse influences to manage and prevent hypertension-related mortality effectively.
Keywords: Environmental Factors, Hypertension, Lifestyle Factors, Meteorological Factors, Mortality, Türkiye

INTRODUCTION

Hypertension, a critical public health issue, is a leading risk factor for cardiovascular diseases and a significant cause of mortality worldwide. The global burden of hypertension has been escalating, with a notable increase in both diagnosis and mortality rates. This trend is not uniform across regions, reflecting a complex interplay of genetic, environmental, and lifestyle factors (Mills et al., 2016). In Türkiye, a country with diverse environmental and socioeconomic landscapes, hypertension mortality data across 81 provinces for 2010 and 2019 present a unique opportunity to explore these dynamics.

Environmental and meteorological factors have a recognizable effect on hypertension. Air quality, in particular, has been linked to cardiovascular morbidity and mortality, with pollutants such as particulate matter and nitrogen dioxide implicated in the exacerbation of hypertensive conditions (Rajagopalan et al., 2018). Additionally, meteorological variables like temperature and humidity have an impact on blood pressure and outcomes related to hypertension over the short and long terms (Yang et al., 2015).

Lifestyle factors, notably smoking and alcohol consumption, are well-established risk factors for hypertension. The relationship between these behaviors and hypertension is multifaceted, involving direct physiological impacts, socio-economic dimensions, and interactions with environmental factors (Roerecke et al., 2018; Virdis et al., 2010). In Türkiye, where smoking and alcohol consumption patterns vary significantly across regions, examining these be-haviors in conjunction with environmental and meteorological data can pro-vide valuable insights into their role in Hypertension mortality.

This manuscript aims to investigate the association of environmental, meteorological, and risky behavior markers with Hypertension mortality trajec-

tories in Türkiye over the years 2010 and 2019 over the years 2010 and 2019 controlling for the known factors of hypertension in general. By integrating data on air quality, meteorological conditions, and smoking and alcohol consumption across 81 provinces, we seek to elucidate the multifactorial nature of Hypertension mortality and its regional variations within Türkiye. This analysis not only contributes to the understanding of Hypertension epidemiology in Türkiye but also adds to the global discourse on the interplay of environmental, behavioral, and health outcomes in the context of non-communicable diseases, and thus help the public health authorities develop more timely and effective healthcare and disease prevention strategies.

METHODOLOGY

The primary focus of this study was on the trends (i.e., trajectories) in hypertension-related mortality at the provincial level. Data on hypertension-induced fatalities across 81 Turkish provinces from 2010 to 2019 were requested from Turkish Statistical Institute. These annual mortality rates were calculated relative to the population of each province and presented as the number of deaths per 100,000 individuals annually. With the current data, computing age-adjusted mortality rate was not possible to be computed.

A range of predictors was obtained from the databases of the Ministry of Environment and Urbanization, including environmental factors like particulate matters (PM_{10}, $PM_{2.5}$), sulfur dioxide (SO2), carbon monoxide (CO), nitrogen dioxide (NO2), ozone (O3), air pressure, humidity, and the number of rainy days per year. Meteorological variables were included, such as maximum, average, and minimum temperatures, wind speed, total sunlight, sun radiation, and electromagnetic field exposure. The median values recorded between 2010 and 2019 served as a representation of these factors. Additionally, to assess the impact of environmental variability on hypertension mortality, we calculated the standard deviations (SD) and coefficients of variation (CV) for these variables over the same period as variability markers. We have 15 environmental variables having longitudinal data and expressed as median, CV and SD, resulting in a total of 45 potential markers. We did not have a longitudinal measurement on the other three environmental markers namely, sunlight, electromagnetic field exposure, and sun radiation, and therefore we were not able

to obtain the variability measures SD and CV for them as additional markers. Lifestyle-related predictors, specifically smoking, alcohol consumption, and exposure to second-hand smoke, were also acquired as critical predictors. In terms of the population demographics, we also computed the proportion of elderly population and male population in each province as a potential predictor.

To analyze the temporal changes in hypertension mortality, we utilized the SAS TRAJ procedure, developed by Jones, Nagin, and Roeder (2001). This analysis identified a three-tier categorization (low, intermediate, and high) as the most fitting description of the mortality trends. An Ordinal Logistic Regression method was then applied to model the probability of a province falling into a higher category with each incremental increase in the predictor variables.

53 different markers were examined in total. To address the issue of multiple testing to reduce the likelihood of false positives, we applied the Benjamini-Hochberg False Discovery Rate (FDR) technique (Benjamini & Hochberg, 1995). For more explicit graphical depiction, the response and predictor variables were standardized to have a mean of zero and a variance of one. All statistical analyses were conducted using SAS® Version 9.4 (Cary, North Carolina, USA).

RESULTS

Trajectory analyses of hypertension mortality data across 81 provinces in Türkiye from 2010 to 2019 resulted in four trajectories, representing shallow/deficient and somewhat stable levels of hypertension mortality to very high levels and highly variable hypertension mortality over time (Figure 1).

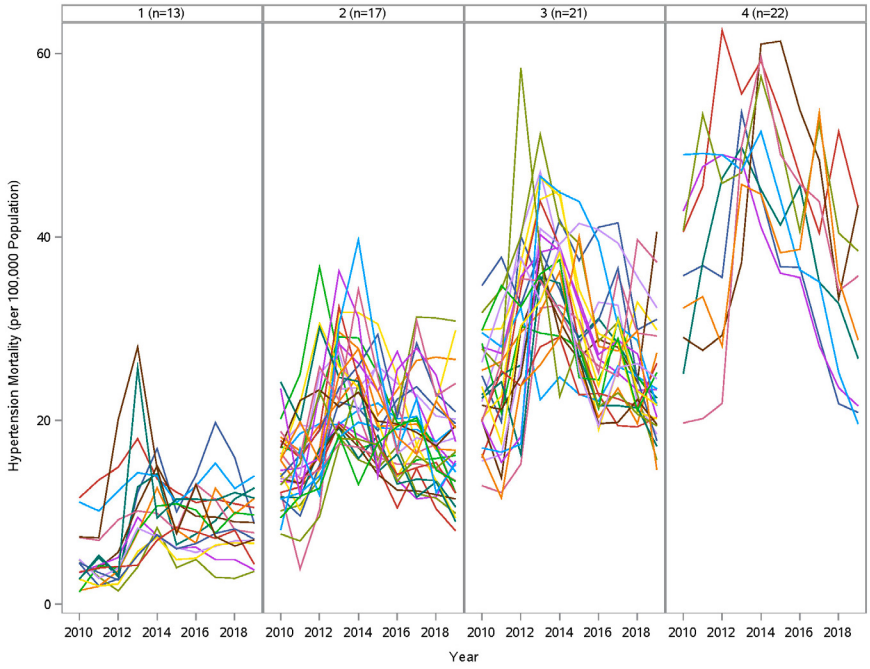

Figure 1. Profiles of Hypertension Mortality by SAS TRAJ procedure
(Numbers in the parentheses represent the number of provinces in the given cluster; each line represents the longitudinal profile of a province.)

We have identified several significant associations with various environmental, meteorological, and lifestyle factors. The results are shown in Table 1, which presents the odds ratios (OR), 95% confidence intervals (CI), p-values, and False Discovery Rate (FDR) corrected p-values for each predictor. Figure 2 depicts the association of these significant markers with hypertension mortality.

Table 1: Predictors significantly associated with Hypertension Mortality

Predictor	OR (95% CI)	p-value	FDR Corrected p-value
Age >=65 Ratio (%)	2.91 (2.12,4.01)	<.0001	2.399E-9
Ever Alcohol Use	1.08 (1.03,1.14)	0.0013	0.00554
Ever Smoking	1.12 (1.04,1.21)	0.0019	0.007159
Humidity (CV)	0.88 (0.84,0.93)	<.0001	0.00002
Humidity (Median)	1.13 (1.07,1.19)	<.0001	0.000059
Humidity (SD)	0.79 (0.71,0.88)	<.0001	0.000072
Male Ratio (%)	0.51 (0.31,0.83)	0.0064	0.022473
Manual Rainy Days (CV)	0.94 (0.92,0.97)	0.0002	0.001212
Maximum Temperature (CV)	0.94 (0.90,0.99)	0.0125	0.036846
Maximum Temperature (SD)	0.66 (0.51,0.85)	0.0014	0.005743
Mean Temperature (Median)	0.83 (0.72,0.96)	0.0095	0.029536
Mean Temperature (SD)	0.40 (0.27,0.60)	<.0001	0.000059
Minimum Temperature (SD)	0.49 (0.33,0.71)	0.0002	0.001212
Particulate Matter-10 (SD)	0.88 (0.82,0.95)	0.0005	0.002183
Rainy Days (CV)	0.92 (0.89,0.95)	<.0001	0.000059
Rainy Days (Median)	1.25 (1.06,1.47)	0.0068	0.022473
Sun Radiation (Per 10 units)	0.91 (0.87,0.95)	<.0001	0.000104
Sunlight (Per 50 units)	0.84 (0.77,0.91)	<.0001	0.000152

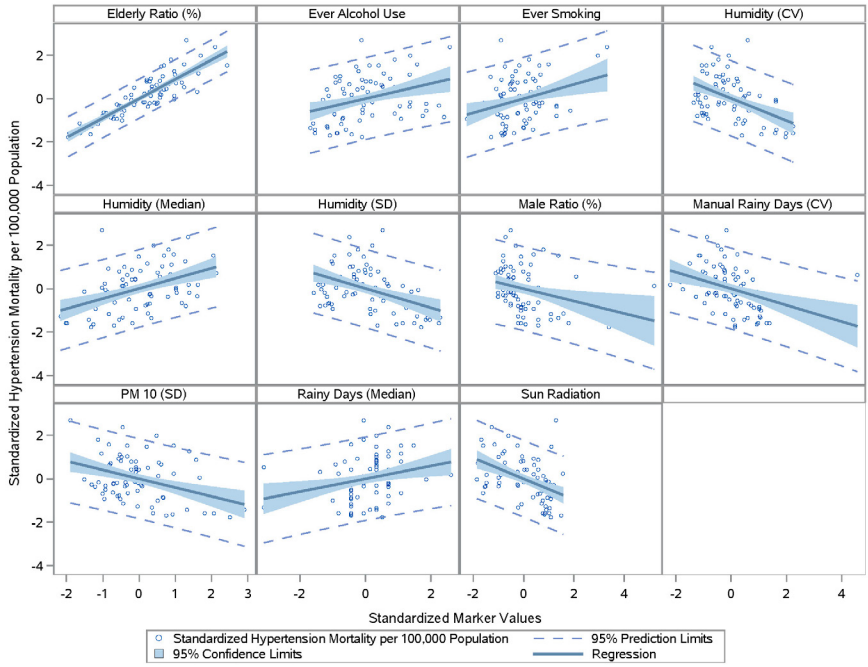

Figure 2. Predictors significantly associated with Hypertension Mortality

Known Factors

All factors known to be associated with Hypertension were also found to be associated with the hypertension mortality. Each percentage point increase in the elderly population in a province increased the odds of being in a higher cluster of hypertension mortality by about three times (OR=2.91, 95% CI: 2.12, 4.01, FDR-adjusted p-value<0.0001). Similarly, smoking and alcohol consumption were found to be positively associated with hypertension mortality. In addition, each 1-percentage point increase in male population in a province decreased the odds of being in a higher cluster of hypertension mortality by about 50% (OR=0.51, 95% CI: 0.31, 0.83, FDR-adjusted p-value=0.0022).

Environmental and Meteorological Factors

Most significant predictor of hypertension mortality was humidity and its variation markers. Each one-unit increase in average humidity increased the odds of being in a higher cluster of hypertension mortality by about 13% (OR=1.13, 95% CI: 1.07, 1.19, FDR-adjusted p-value<0.0001) while each one-

unit increase in the humidity CV resulted in a 12% reduction, and each one-unit increase in the humidity SD resulted in a 21% reduction in the odds of being in a higher cluster of hypertension mortality. An associated variable to humidity, rainy days showed similar association with hypertension mortality.

Standard Deviation of Particulate Matter-10 (PM_{10}) reduced the odds of being in a higher cluster of hypertension mortality by 12%, suggesting that the provinces with higher variation of PM_{10} concentration over time reported reduced number of hypertension related deaths.

Temperature: Variability and median values of maximum, mean, and minimum temperatures were all significantly associated with hypertension mortality. For example, higher variability measured through SD of temperature substantially decreased the odds of hypertension mortality (OR = 0.40, 95% CI: 0.27, 0.60, FDR-adjusted p-value<.0001).

Both sun radiation and sunlight were found to be associated with lower likelihood of hypertension mortality.

Other environmental and meteorological markers were not found to be significantly associated with hypertension mortality.

We have constructed a multivariable logistic regression controlling the effects elderly population size and smoking rate, the only predictor which still showed some level of significance was humidity with an OR of 1.067 (95% CI: 0.995, 1.114, p=0.071). The predictive ability of this model was quite high with a AUC of 0.927.

DISCUSSIONS AND CONCLUSIONS

This study's findings, as outlined in Table 1 and Figure 2, provide a comprehensive view of the multifactorial nature of hypertension mortality in Türkiye. Our analyses confirmed the known lifestyle factors in relation to hypertension mortality such as smoking, alcohol consumption, male and elderly sizes of population (Bufford, 2016; Virdis et al., 2010; Brown et al., 2009). Our models also identified several significant environmental and meteorological markers and thus offer insights into the complex interplay of these elements.

Humidity seemed to be the most critical air quality marker in predicting hypertension mortality. Both median humidity and its variation measures through CV and SD were significant even after multiplicity correction. While

increasing humidity resulted in increased likelihood of hypertension mortality, contrary to what Chen and Zhang (2015) reported, the increasing variation measures of humidity (CV and SD) decreased the likelihood. Chen et al. (2014) discusses the association of PM_{10} with hypertension mortality. Our analyses did not confirm these positive associations as both PM_{10} and $PM_{2.5}$ in our models were not significant while we have shown that the variation of PM_{10} was negatively associated with hypertension mortality.

The significant impact of temperature variability on hypertension mortality underscores the vulnerability of hypertensive individuals to climatic changes. Such a variability aligns with global trends indicating increased cardiovascular risks associated with extreme temperatures (Jones et al., 2001). Jehn et al. (2002) discuss the increased blood pressure variability in winter months, which is indirectly in line with what we conclude in our study as well. The relationship of temperature and humidity with hypertension mortality adds to the growing evidence of the role of meteorological factors in cardiovascular health (Lee et al., 2019).

We have also identified sunlight and sun radiation as significant predictors of hypertension mortality; in fact, such significant findings are not very surprising as these two environmental markers are highly negatively correlated with humidity overall and our model results are in this anticipated direction. Interestingly, in line with our findings, Rostand et al. (2016) suggests a nega-tive association of insolation (i.e., exposure to solar radiation) with increased blood pressure.

Strengths and Weaknesses

The study's primary strength lies in its comprehensive approach, integrating a wide range of predictors across a large geographical area over an extended period. Such a strength provides a robust framework for understanding regional variations in hypertension mortality.

The study's observational nature limits its ability to infer causality. Potential confounders and biases inherent in the data sources could also affect the results. The lack of individual-level data also limits the ability to account for personal health behaviors and genetic predispositions.

Public Health Implications

The findings highlight the importance of considering environmental and meteorological factors in public health strategies for managing hypertension. Policies aimed at reducing air pollution and mitigating the impacts of climate change could be beneficial. The study underscores the need for continued efforts in tobacco and alcohol control, particularly in regions with high consumption rates.

Future Research

Future studies should incorporate individual-level data to better understand the interactions between personal health behaviors, genetic factors, and environmental exposures. Investigating the mechanisms underlying the observed associations, particularly the protective effect of exposure to smoke at home, could provide valuable insights. Longitudinal studies exploring the impact of climate change on hypertension mortality would be beneficial in guiding future public health policies.

In conclusion, this study contributes significantly to understanding hypertension mortality in Türkiye, highlighting the complex interplay of environmental, meteorological, and lifestyle factors. The findings emphasize the need for developing public health strategies that take into account the size of elderly population, smoking rate and high-risk behavior rates, and environmental markers especially humidity.

Ethical Approval: We have obtained the umbrella ethics approval from Istanbul Medipol University IRB for our TUBITAK Directorate of Science Fellowships and Grant Programmes (BIDEB)-2232 International Fellowship for Outstanding Researchers project titled “Feasibility assessment and utility of combining streaming national healthcare data with environmental and food intake data to improve health policy and outcomes” and this particular manuscript was part of our research under this application (Approval Date: September 09, 2019, Application number: 10840098-604.01.01-E.53819)

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