

# The place of digital transformation and artificial intelligence in Türkiye's health policies: A qualitative evaluation

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## Abstract

Examining health policies of countries with a focus on digital transformation and artificial intelligence is of critical importance not only in terms of health but also in economic, social and administrative terms. This research aims to investigate the current status of digital transformation and artificial intelligence in Türkiye's healthcare system by examining the Twelfth Development Plan (2024-2028) (TDP) and the Ministry of Health 2024-2028 Strategic Plan (MHSP) and to make a consistency assessment between these two policy documents in line with the thematic areas that emerged as a result of the qualitative analysis. This research, which has a qualitative research design, is based on thematic content analysis. The two main questions of the research are as follows; 'What is the current status of digital transformation and artificial intelligence in health services in Türkiye within the framework of TDP and MHSP?' and 'What is the level of consistency between TDP and MHSP?' The universe of the research consists of TDP and MHSP. The research data were accessed electronically from the official websites of the institutions. Data analysis was carried out with thematic coding technique using MaxQDA 2024 Analytics Pro and Microsoft Excel programs. A total of 223 health policy goal were identified, 183 of which were in the TDP and 40 in the MHSP. As a result of the content analysis of the TDP and MHSP, 9 themes, 19 categories and 47 codes were obtained. Digital transformation in health services in Türkiye is planned comprehensively, but the issue of artificial intelligence is not emphasized enough. There are differences between the two plans in terms of priorities, strategies and policies regarding digitalization and artificial intelligence in the context of health services. Improvements in these areas will make the Turkish health system more sustainable, effective and inclusive with a focus on digital transformation and artificial intelligence.

**Keywords:** Digital transformation, artificial intelligence, health policies, health management

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## Introduction

Digital transformation and artificial intelligence (AI) have brought about revolutionary developments and changes in many sectors, including healthcare. These emerging technologies enable the redefinition of traditional healthcare delivery methods, greater operational efficiency, diagnostic accuracy, personalization of treatment, and improved resource management.

Recent studies indicate that digital transformation and artificial intelligence applications applied to the healthcare sector have the potential to accelerate clinical decision-making processes, optimize data management, and significantly reduce costs associated with healthcare [1-8]. Digital transformation involves not only the adoption of advanced technologies, but also organizational restructuring and a management approach focused on change and innovation. According to Gopal (2019), organizations that manage to strategically integrate digitalization can achieve long-term competitive advantages, especially in sectors such as healthcare, where precision and efficiency are decisive factors.

Many countries globally are exploring ways to integrate AI into their healthcare systems [9]. Countries that have made significant progress in the adoption of AI in healthcare are seen to be those that have implemented consistent national policies, have strong government support, and implement effective collaboration between the public and private sectors [10,11]. In this sense, Türkiye faces both opportunities and challenges in the use of emerging technologies in the healthcare sector [12,13].

Development plans are fundamental documents that provide a strategic roadmap for countries to achieve their economic growth, social welfare and sustainable development goals, ensuring the effective and efficient use of resources [14]. In its Twelfth Development Plan, Türkiye prioritizes digitalization as a strategic axis for the improvement of various sectors, including health [15]. This plan focuses not only on the adoption of new technologies, but also on the creation of digital infrastructures and the training of personnel to adapt to these innovations. Ministries, which are the main

institutions responsible for the formation and implementation of public policies, determine their own roadmaps by preparing their own strategic plans in line with development plans. In Türkiye, the Ministry of Health prepares five-year strategy plans with a strategic approach to health services. The 2024-2028 Strategic Plan of the Ministry of Health of the Republic of Türkiye aims to promote healthy living, strengthen and integrate primary and preventive health services, provide quality health services, develop institutional capacity and establish sustainability, and develop technology in health [16].

As a developing country, examining Türkiye's health policies is of critical importance not only in terms of health but also in economic, social and administrative terms. The analysis of plans including health policies enables understanding which policies are prioritized in health services within a five-year period and strengthening decision-making processes. In this way, national development goals, resource allocation, budgeting, international competition, collaborations can be understood and the implementation processes, effects, sustainability and social impacts of policies can be evaluated [17]. This research aims to investigate the current status of digital transformation and artificial intelligence in Türkiye's healthcare system by examining the Twelfth Development Plan (2024-2028) and the Ministry of Health 2024-2028 Strategic Plan and to make a consistency assessment between these two policy documents in line with the thematic areas that emerged as a result of the qualitative analysis.

## Materials and Methods

In this research, the Standards for Reporting Qualitative Research (SRQR) checklist, which is widely used in qualitative research, was used to ensure methodological transparency and increase reporting quality.

### Ethical approval

In this research, only documents obtained from open sources were used as data sources. Since there is no intervention with any human participants or data collection process within the scope of the research, ethics committee approval is not required.

### Type and design of the research

This research, which has a qualitative research design, is based on thematic content analysis. This approach is a method used especially for the interpretation and meaning of interviews, texts, documents, guides and reports [18-20]. This research aims to investigate the current status of digital transformation and artificial intelligence in Türkiye's healthcare system by examining the Twelfth Development Plan (2024-2028) and the Ministry of Health 2024-2028 Strategic Plan and to make a consistency assessment between these two policy documents in line with the thematic areas that emerged as a result of the qualitative analysis. Content analysis was preferred in this research because it allows the separation of data into categories and emerging themes reflecting the basic policies and strategies of a specific context [21]. This method is complemented by a systematic review of the literature on the implementation of digital transformation and artificial intelligence in public policies in health systems globally, allowing the evaluation of Türkiye's current situation and the consistency between the plans. In this context, the two main questions of the research are as follows;

- What is the current status of digital transformation and artificial intelligence in healthcare services in Türkiye within the framework of the Twelfth Development Plan (2024-2028) and the Ministry of Health 2024-2028 Strategic Plan?
- What is the level of consistency between the Twelfth Development Plan (2024-2028) and the Ministry of Health 2024-2028 Strategic Plan in terms of digital transformation, artificial intelligence, and related thematic areas in healthcare?

These questions not only enable the identification of emerging technologies in healthcare services, but also the assessment of strategic outcomes and consistency encountered in public policies.

### Research universe and sample

The universe of this research consists of Türkiye's Twelfth Development Plan (2024-2028) and the Ministry of Health's 2024-2028 Strategic Plan. The sample selection process was carried out through

purposive sampling, focusing on sections that explicitly address digital transformation and artificial intelligence in the context of healthcare services [22].

### Data collection tools

Official documents were used to collect research data [23]. In the study, the reliability of the findings was ensured by source verification and consistency checks [24]. In this context, the Twelfth Development Plan (2024-2028) was accessed electronically from the website of the Strategy and Budget Presidency of the Republic of Türkiye and the Ministry of Health 2024-2028 Strategic Plan from the website of the Ministry of Health of the Republic of Türkiye [15,16].

### Data analysis

Data analysis was performed using the thematic coding technique, which enables the identification of patterns, similarities, and differences in the presentation of digital transformation and artificial intelligence in the context of healthcare in the plans [19,25]. This analysis, which took place in four stages, consists of sample selection, category development, analysis unit determination, and digitization stages. MaxQDA 2024 Analytics Pro Program, a qualitative analysis tool that allows systematic organization of data, and Microsoft Excel program were used in the analysis.

The coding process was performed after the data was assimilated by the researcher in the data analysis. After the coding was completed, the codes were brought together and examined. Common aspects between the codes were identified and divided into categories. Themes were created after the codes and categories were determined. For example; Digital Transformation in Healthcare (Theme)> Digitalization (Category)> Digital Information Flow (Code).

### Results

A content analysis was conducted for the Twelfth Development Plan (2024-2028) (TDP) and the Ministry of Health 2024-2028 Strategic Plan (MHSP). The study findings were addressed under nine themes: Digital Transformation in Healthcare Services, Artificial Intelligence in

**Table 1.** Category, code and frequency of the theme of digital transformation in healthcare.

Theme	Category	Code	TDP Frequency	MHSP Frequency	Total Frequency
Digital Transformation in Healthcare	Digitalization	Digital Information Flow	32	1	33
		E-Health Applications	2	-	2
		Technological Transformation	12	3	15
	Data Security and Management	Data Security	1	-	1
		Rational Laboratory Practices	-	2	2
		Innovative Solutions	20	3	23
<b>Total</b>			67	9	76

Healthcare Services, Service Quality and Patient Safety, Strategic Management in Healthcare Systems, Public Health and Preventive Services, Elderly and Disabled Healthcare, Innovation and Research in Healthcare Services, Physical and Infrastructure Capacity, Emergency and Disaster Management.

When the documents were examined, 183 health policy goal were identified in the Twelfth Development Plan (2024-2028); 40 health policy goal were identified in the Ministry of Health 2024-2028 Strategic Plan. A total of 223 health policy goal were identified in both documents.

In the content analysis, 9 themes, 19 categories and 47 codes were created. The first three codes with the highest frequency in TDP are Digital Information Flow (n:32), Service Quality (n:30), Risk Management (n:25). The first three codes with the highest frequency in MHSP are Service Quality (n:10), Health Management (n:10), Preventive Health Services (n:6). The first three codes with the highest frequency in total are Service Quality (n:40), Digital Information Flow (n:33), Health Management (n:33). The first three codes with the lowest frequency in total are Data Security (n:1), Health Tourism (n:1), Disabled

Health (n:1), Organ Transplantation (n:1), Food Safety (n:1), Audit (n:1), Flexible Working Models (n:1), Emergency Management (n:1), Employee Health (n:1).

While there are no Rational Laboratory Applications, Health Tourism, Mental Health, Disabled Health, Organ Transplantation, Audit, Emergency Management, Employee Health codes in TDP, there are no E-Health Applications, Data Security, Artificial Intelligence, Accreditation, Export Strategies, Early Diagnosis, Entrepreneurship, Food Safety, Safe Health Services, Supply Chain Management, Flexible Working Models codes in MHSP. There are no Crisis Management and Resilience categories in TDP, and there are no Security and Flexible Working categories in MHSP. The theme of Emergency and Disaster Management is only in MHSP.

#### Digital transformation in healthcare

Digital Transformation in Healthcare (TDP:67 MHSP:9 Total:76); Digitalization (TDP:46 MHSP:4 Total:50), Data Security and Management (TDP:21 MHSP:5 Total:26) categories and Digital Information Flow (TDP:32 MHSP:1 Total:33),

**Table 2.** Category, code and frequency of the theme of artificial intelligence in healthcare.

Theme	Category	Code	TDP Frequency	MHSP Frequency	Total Frequency
Artificial Intelligence in Healthcare	Personalized Healthcare Services	Artificial Intelligence	2	-	2
		Personalized Medicine	2	1	3
	Advanced Technological Solutions	Biotechnological Products	14	1	15
<b>Total</b>			18	2	20

**Table 3.** Category, code and frequency of the theme of service quality and patient safety.

Theme	Category	Code	TDP Frequency	MHSP Frequency	Total Frequency
Service Quality and Patient Safety	Patient Satisfaction and Safety	Patient Safety	2	4	6
		Patient Satisfaction	1	1	2
		Employee Satisfaction	1	1	2
	Quality Management	Service Quality	30	10	40
		Clinical Quality	16	1	17
		Accreditation	4	-	4
<b>Total</b>			54	17	71

E-Health Applications (TDP:2 MHSP:0 Total:2), Technological Transformation (TDP:12 MHSP:3 Total:15), Data Security (TDP:1 MHSP:0 Total:1), Rational Laboratory Applications (TDP:0 MHSP:2 Total:2) and Innovative Solutions (TDP:20 MHSP:3 Total:23) codes are included.

The emphasis on digital transformation in healthcare is much more pronounced in TDP (n:67), while this emphasis has a relatively lower frequency in MHSP (n:9). E-Health Applications and Data Security are only included in TDP, while Rational Laboratory Applications are only included in MHSP. The most emphasis in TDP is on Digital Information Flow (n:32), while in MHSP it is on Technological Transformation (n:3). The topic of Data Security has the lowest frequency in both TDP (n:1) and MHSP (n:0).

#### Artificial intelligence in healthcare

In Artificial Intelligence in Healthcare (TDP:18 MHSP:2 Total:20); Personalized Healthcare Services (TDP:4 MHSP:1 Total:5) and Advanced Technological Solutions (TDP:14 MHSP:1 Total:15) categories and Artificial Intelligence

(TDP:2 MHSP:0 Total:2), Personalized Medicine (TDP:2 MHSP:1 Total:3) and Biotechnological Products (TDP:14 MHSP:1 Total:15) codes are included.

While the topics of Artificial Intelligence and Personalized Medicine in Healthcare are addressed at low frequency in both TDP (n:4) and MHSP (n:1), the highest frequency is in the topic of Biotechnological Products (n:15). The Artificial Intelligence code is only included in TDP.

#### Service quality and patient safety

In Service Quality and Patient Safety (TDP:54 MHSP:17 Total:71); Patient Satisfaction and Safety (TDP:4 MHSP:6 Total:10) and Quality Management (TDP:50 MHSP:11 Total:61) categories and Patient Safety (TDP:2 MHSP:4 Total:6), Patient Satisfaction (TDP:1 MHSP:1 Total:2), Employee Satisfaction (TDP:1 MHSP:1 Total:2), Service Quality (TDP:30 MHSP:10 Total:40), Clinical Quality (TDP:16 MHSP:1 Total:17) and Accreditation (TDP:4 MHSP:0 Total:4) codes are included.

**Table 4.** Category, code and frequency of the theme of strategic management in health systems.

Theme	Category	Code	TDP Frequency	MHSP Frequency	Total Frequency
Strategic Management in Health Systems	Management and Planning	Health Management	23	10	33
		Risk Management	25	4	29
		Financial Sustainability	22	2	24
	Control and Monitoring	Control	10	1	11
		Supply Chain Management	11	2	13
	International Collaborations	International Cooperation	13	3	16
		Health Tourism	-	1	1
		Export Strategies	8	-	8
	<b>Total</b>			112	23

**Table 5.** Category, code and frequency of the theme of public health and preventive services.

Theme	Category	Code	TDP Frequency	MHSP Frequency	Total Frequency
Public Health and Preventive Services	Protective Services	Preventive Health Services	15	6	21
		Early Diagnosis	5	-	5
		Vaccination	7	1	8
	Environmental and Social Health	Environmental Health	2	1	3
		Community Health	2	1	3
		Mental Health	-	1	1
		Health Literacy	6	3	9
<b>Total</b>			37	13	50

Patient Satisfaction and Safety is emphasized relatively more in MHSP (n:6) compared to TDP (n:4). While Service Quality has the highest frequency in both TDP (n:30) and MHSP (n:10), Patient Satisfaction and Employee Satisfaction have the lowest frequency in both TDP (n:1) and MHSP (n:1). The accreditation code is only included in TDP.

#### Strategic management in health systems

In Strategic Management in Health Systems (TDP: 112 MHSP: 23 Total: 135); Management and Planning (TDP:70 MHSP:16 Total:88), Audit and Monitoring (TDP:21 MHSP:3 Total:24) and International Collaborations (TDP:21 MHSP:4 Total:25) categories and Health Management (TDP:23 MHSP:10 Total:33), Risk Management (TDP:25 MHSP:4 Total:29), Financial Sustainability (TDP:22 MHSP:2 Total:24), Audit (TDP:10 MHSP:1 Total:11), Supply Chain Management (TDP:11 MHSP:2 Total:13), International Collaboration (TDP:13 MHSP:3 Total:16), Health Tourism (TDP:0 MHSP:1

Total:1) and Export Strategies (TDP:8 MHSP:0 Total:8) codes are included.

Health Management (n:33) is the code with the highest frequency. While Health Tourism is only available in MHSP, Export Strategies are only available in TDP.

#### Public health and preventive services

Public Health and Preventive Services (TDP:37 MHSP:13 Total:50); Preventive Services (TDP:27 MHSP:7 Total:34) and Environmental and Social Health (TDP:10 MHSP:6 Total:16) categories and Preventive Health Services (TDP:15 MHSP:6 Total:21), Early Diagnosis (TDP:5 MHSP:0 Total:5), Vaccination (TDP:7 MHSP:1 Total:8), Environmental Health (TDP:2 MHSP:1 Total:3), Community Health (TDP:2 MHSP:1 Total:3), Mental Health (TDP:0 MHSP:1 Total:1) and Health Literacy (TDP:6 MHSP:3 Total:9) codes are included.

Preventive Health Services is the most emphasized topic in both TDP (n:15) and MHSP

**Table 6.** Category, code and frequency of the theme of elderly and disabled health.

Theme	Category	Code	TDP Frequency	MHSP Frequency	Total Frequency
Elderly and Disabled Health	Special Needs Health Services	Disabled Health	-	1	1
		Transplantation	-	1	1
		Elderly Care	7	1	8
	Rare and Chronic Diseases	Rare Diseases	3	1	4
		Infectious Diseases	2	2	4
		Dependency Management	5	2	7
<b>Total</b>			17	8	25

**Table 7.** Category, code and frequency of innovation and research in healthcare.

Theme	Category	Code	TDP Frequency	MHSP Frequency	Total Frequency
Innovation and Research in Healthcare	R&D and Technology	Biotechnological Products	14	1	15
		Entrepreneurship	3	-	3
		Innovative Solutions	20	1	21
	Safety	Food Safety	1	-	1
		Safe Health Services	2	-	2
<b>Total</b>			40	2	42

(n:6). While Mental Health, which has the least frequency (n:1), is only included in MHSP, Early Diagnosis is only included in TDP.

### Elderly and disabled health

In Elderly and Disabled Health (TDP:17 MHSP:8 Total:25); Special Needs Health Services (TDP:7 MHSP:3 Total:10) and Rare and Chronic Diseases (TDP:10 MHSP:5 Total:15) categories and Disabled Health (TDP:0 MHSP:1 Total:1), Organ Transplantation (TDP:0 MHSP:1 Total:1), Elderly Care (TDP:7 MHSP:1 Total:8), Rare Diseases (TDP:3 MHSP:1 Total:4), Infectious Diseases (TDP:2 MHSP:2 Total:4) and Addiction Management (TDP:5 MHSP:2 Total:7) codes are included.

Disabled Health and Organ Transplantation are only included in MHSP. While Elderly Care (n: 7) and Addiction Management (n: 5) are relatively more emphasized in TDP, Rare Diseases (n: 1) are relatively less emphasized.

### Innovation and research in healthcare

In Healthcare Innovation and Research (TDP:40 MHSP:2 Total:42); R&D and Technology (TDP:37 MHSP:2 Total:38) and Security (TDP:3 MHSP:0 Total:3) categories and Biotechnological Products (TDP:14 MHSP:1 Total:15), Entrepreneurship

(TDP:3 MHSP:0 Total:3), Innovative Solutions (TDP:20 MHSP:1 Total:21), Food Safety (TDP:1 MHSP:0 Total:1) and Safe Healthcare Services (TDP:2 MHSP:0 Total:2) codes are included.

Innovation and Research in Healthcare is emphasized considerably more in TDP (n:39) compared to MHSP (n:2). Biotechnological Products (n:14) and Innovative Solutions (n:20) have high frequency in TDP. Entrepreneurship, Food Security and Safe Health Services are only included in TDP.

### Physical and infrastructure capacity

In Physical and Infrastructure Capacity (TDP:17 MHSP:2 Total:19); Infrastructure and Resource Management (TDP:16 MHSP:2 Total:18) and Flexible Working (TDP:1 MHSP:0 Total:1) categories and Physical Infrastructure (TDP:5 MHSP:1 Total:6), Audit (TDP:0 MHSP:1 Total:1), Supply Chain Management (TDP:11 MHSP:0 Total:11) and Flexible Working Models (TDP:1 MHSP:0 Total:1) codes are included.

TDP places relatively more emphasis on Supply Chain Management (n:11). Supply Chain Management and Flexible Working Models are only included in TDP, while Audit is only included in MHSP.

**Table 8.** Category, code and frequency of physical and infrastructure capacity.

Theme	Category	Code	TDP Frequency	MHSP Frequency	Total Frequency
Physical and Infrastructure Capacity	Infrastructure and Resource Management	Physical Infrastructure	5	1	6
		Control	-	1	1
		Supply Chain Management	11	-	11
	Flexible Working and Security	Flexible Working Models	1	-	1
<b>Total</b>			17	2	19

**Table 9.** Category, code and frequency of emergency and disaster management.

Theme	Category	Code	TDP Frequency	MHSP Frequency	Total Frequency
Emergency and Disaster Management	Crisis Management	Emergency Management	-	1	1
	Durability	Employee Health	-	1	1
<b>Total</b>			0	2	2

### Emergency and disaster management

Emergency and Disaster Management (TDP:0 MHSP:2 Total:2); Crisis Management (TDP:0 MHSP:1 Total:1) and Resilience (TDP:0 MHSP:1 Total:1) categories and Emergency Management (TDP:0 MHSP:1 Total:1) and Employee Health (TDP:0 MHSP:1 Total:1) codes are included.

Emergency and Disaster Management is only included in MHSP. Emergency Management (n:1) and Employee Health (n:1) are included at a relatively low frequency.

### Discussion

In this study, which was conducted to examine the current status of digital transformation and artificial intelligence in health services in Türkiye within the framework of the Twelfth Development Plan (2024-2028) and the Ministry of Health 2024-2028 Strategic Plan and the consistency between the plans, 9 themes, 19 categories and 47 codes were obtained as a result of the content analysis of TDP and MHSP. In this direction, it is seen that the issues of Digital Transformation, Service Quality and Patient Safety in Health Services and Strategic Management in Health Systems have an important place in both plans, but there is not enough emphasis on Artificial Intelligence in Health Services and there are some differences between the two plans.

While there is a very clear emphasis on digital transformation in TDP, this emphasis is relatively less in MHSP. This situation shows that the subject is given importance at the national level. In this direction, it is seen that broader strategic orientations are put forward at the national level regarding the subject, and the Health Ministry focuses more on operational processes. The inadequacy in e-health and data security in both plans indicates the need to develop policies in this area. Similarly, Özdemir and Şahin (2024) state that the future of digital transformation in

healthcare has significant potential, but there are difficulties in terms of infrastructure, cost and data security [26]. The German government states that one of the main reasons for the delay in the implementation of the national electronic health record system in the country is data privacy issues [27]. Therefore, it is essential to strengthen data security policies in the digitalization process of healthcare services [28].

The low frequency of artificial intelligence and personalized medicine topics in both plans indicates that there is a need for development in these areas. Biotechnological solutions have an important place in health policies. However, more strategic planning is needed to transform these solutions into patient-centered personalized services. While the inclusion of biotechnology and personalization topics in the MHSP shows that the Ministry of Health is working in these areas, the absence of studies on this subject in the TDP poses a problem in terms of the integrity of national health policies. Studies on the subject reveal various deficiencies in health policies regarding artificial intelligence [29-30]. A study conducted specifically for Türkiye also states that a clear vision and strategy have not been established in policy making regarding artificial intelligence [31]. Including more artificial intelligence in health policies is of critical importance in order to benefit from the potential benefits of artificial intelligence.

In both plans, service quality is one of the most emphasized issues. However, clinical quality and especially accreditation processes need to be strengthened further. Patient safety is emphasized more in the MHSP. However, improvements are needed in patient satisfaction and employee satisfaction. This situation shows that the Ministry of Health addresses quality policies more through general service improvements. Özdemir and Burma, (2023)

emphasize that Türkiye's digital transformation efforts in health have the potential to increase the quality of national health services [32]. Studies show that health policies are a fundamental element affecting the quality of health services. Well-designed and effectively implemented policies can significantly increase service quality by supporting digital transformation, encouraging innovation, observing ethical values, ensuring stakeholder participation, managing costs and training a qualified workforce [29,33]. On the contrary, inadequate or incorrect policies can lead to a decrease in service quality and a decrease in the effectiveness of the health system [34].

Health management, risk management and financial sustainability are critical components for health systems. Both plans emphasize these components. This situation shows the importance of strategic management in the health sector. The fact that health tourism is only included in the MHSP and export strategies are only included in the TDP shows Türkiye's integration weakness in this area. The integration weakness in health policies reduces the capacity of health systems to cope with complex problems, restricts the potential of digital transformation, makes stakeholder participation difficult, leads to fragmentation in e-health systems, causes gaps between research and practice, prevents the achievement of strategic goals, disrupts local production efforts and makes cost management difficult [35-36]. Therefore, it is of great importance to adopt and implement a strong integration approach in order to increase the effectiveness of health policies and the quality of health services [37].

In both plans, the importance given to public health and preventive services is evident. While both plans emphasize preventive health services, early diagnosis and vaccination are not sufficiently included in the MHSP. This situation expresses the need for strategic planning in this area. Environmental and social health issues are not sufficiently emphasized in both plans. In particular, the fact that mental health is only addressed in the MHSP indicates that this issue should be addressed more at the national level. The emphasis on health literacy in both plans is

a positive development in terms of raising public awareness. Elements such as digitalization, innovation, multi-sectoral cooperation, effective governance and stakeholder participation play a critical role both in the formation of health policies and in achieving public health goals [32,35]. Any weakness of integration in health policies can negatively affect the effectiveness of public health efforts [31]. In order to improve public health, it is important to establish evidence-based, holistic and well-integrated health policies [34].

When both plans are examined, it is necessary to develop policies regarding elderly and disabled health. Although there is a national emphasis on elderly care, the Ministry of Health needs to develop its policies in this area. The fact that disabled health and organ transplantation issues are only included in the MHSP indicates the lack of national level policies in this regard. It is seen that rare and infectious diseases are not given enough space in health policies. Although both plans emphasize addiction management, this issue needs to be given more space both nationally and at the ministry level. Current health, financial and social support services for the elderly in Türkiye are insufficient to meet their needs, and investments need to be made in policies and services that will support active and healthy aging [38].

It is seen that health policies regarding biotechnology and innovative solutions have an important place at the national level and investments are planned. However, in order for these investments to be integrated into health services, the Ministry of Health needs to produce more policies in this area. The fact that safe health services, food safety and entrepreneurship are only included at the national policy level indicates the lack of implementation by the Ministry of Health in this regard. Innovative approaches and solutions are important elements that shape the future in order to improve health and achieve better health outcomes [39]. The fact that Türkiye has not yet reached sufficient saturation in this area shows that there are many opportunities waiting to be discovered [34].

The development of physical infrastructure is important for the sustainability and quality of health services. The fact that supply chain management is emphasized only in the TDP indicates that the Ministry of Health needs to develop its policies in this area for the provision of uninterrupted and effective health services. The emphasis on flexible working models in the TDP expresses the intention at the national level in this regard. In Türkiye, the infrastructure of health institutions needs to be compatible with technology [34]. It is stated that digital technologies and artificial intelligence can be integrated into supply chain management; It is emphasized that digitalization in the pharmaceutical sector in Pakistan can help drug supply management systems [40]. Telehealth represents an example of flexible working models by allowing health professionals to provide services remotely [32]. The necessary legal arrangements need to be made and the infrastructure needs to be strengthened for the model to be widespread. A regulation on the provision of remote health services has been published in Türkiye [41].

The emphasis on emergency and disaster management in the MHSP indicates that the Ministry of Health has increased its awareness of emergency management and employee health. However, the fact that these issues are not included in the TDP indicates that comprehensive strategies and policies need to be developed at the national level. In addition to increasing non-communicable diseases in low- and middle-income countries, the costs of climate change, state debts and regional conflicts are undermining global health security [35]. An important way to increase the resilience of the health system in emergencies is to increase domestic production capacity in Türkiye [37,42].

This study has some limitations. The inclusion of only TDP and MHSP in the study and the qualitative approach limit the generalizability of the study. Therefore, different policy documents and different methodological methods should be taken into consideration in future studies.

## Conclusion

In this study, the current status of digital transformation and artificial intelligence in health services in Türkiye and the consistency between MHSP and TDP were evaluated. The study shows that the subject is addressed at different levels, including digital transformation, artificial intelligence, service quality and patient safety, strategic management, public health and preventive services, elderly and disabled health, innovation and research, physical and infrastructural capacity, emergency and disaster management.

In Türkiye, digital transformation in healthcare is planned comprehensively, but the issue of artificial intelligence is not given enough emphasis. There are differences between the two plans in terms of priorities, strategies and policies regarding digitalization and artificial intelligence in the context of healthcare.

There is a need for further development in data security, patient-centered applications and personalized medical applications. Biotechnology has an important place in health policies. Quality management is strongly addressed in health services, but more policies are needed in clinical quality, accreditation, patient and employee satisfaction.

Strategic management has an important place in the Turkish health system. The Ministry of Health needs to produce more policies in auditing, supply chain management and export strategies. There is a need for more integrated policies in health tourism both at the Ministry of Health and at the national level.

Although public health and preventive services are a strong policy area, more policies need to be produced in environmental health, early diagnosis, vaccination and mental health. Integrated policies should be developed at the national level in Türkiye regarding elderly and disabled health and rare and chronic diseases. Although innovative health solutions and biotechnology policies are strongly included in the plans, comprehensive strategies should be developed by the Ministry of Health in order to integrate them into health services. Comprehensive strategies are needed

especially in R&D, innovation ecosystem and entrepreneurship.

More policies need to be developed on strengthening physical infrastructure, auditing, supply chain management and implementing flexible working models. Emergency and disaster management should be included more in national development plans and the Ministry of Health's policies on this issue should be better integrated with national policies. Improvements in these areas will make the Turkish health system more sustainable, effective and inclusive with a focus on digital transformation and artificial intelligence.

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### Conflict of interest

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### Data availability statement

The data set underlying the findings presented in this study can be obtained by request from the corresponding author.

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