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Original Research Article

Telemedicine in Senegal in the Digital Age: Knowledge, Perceptions, Attitudes, and Challenges of Healthcare Professionals Regarding Remote Consultations

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Abstract: ***Background*:** Telemedicine has become a key tool for maintaining healthcare delivery, especially during the COVID-19 pandemic, which transformed remote consultation practices. In Senegal, the adoption of telemedicine remains partial and requires understanding healthcare professionals' knowledge, perceptions, and attitudes. ***Objectives*:** To assess knowledge, perceptions, attitudes, and practices of healthcare professionals in Senegal regarding telemedicine, and to identify barriers and challenges to its adoption. ***Methods*:** This was a cross-sectional descriptive and analytical study from September 10 to 19, 2025, among healthcare professionals in Senegal. Questionnaires were administered online via KoboToolbox. Data were analyzed using RStudio version 4.4.0 and Excel. Informed consent and anonymity were fully respected. ***Results*:** Among the 495 participants, there were 170 physicians, 136 nurses, 58 pharmacists, 52 midwives, 38 dentists, 5 veterinarians, and 33 support staff. Mean age was 35.19 ± 7.48 years, sex ratio = 1.33. Most participants (87.5%) had previously heard of telemedicine, primarily through colleagues (169), scientific journals (118), and media (35). Actual use involved 336 participants at least once, with WhatsApp as the main tool for teleconsultation and remote monitoring. Only 114 participants (23.03%) were aware of the legal framework. Teleconsultation was considered most suitable for general practice by 240 participants, while chronic diseases and obstetrics-gynecology accounted for 82 (16.6%) and 52 (10.5%) responses, respectively. Most recognized the importance of informed consent (84.2%). Major barriers included lack of training, weak regulation, and poor internet connectivity. ***Conclusion*:** Despite limited knowledge, healthcare professionals in Senegal perceive telemedicine as a useful and necessary tool, especially for ensuring continuity of care post-COVID-19. Targeted training and a clear legal framework are essential to strengthen adoption and effectiveness of remote consultations.

Keywords: Telemedicine, Digital Health, Health Professionals, Senegal, Sub-Saharan Africa.

INTRODUCTION

The digitalization of health constitutes a revolution, notably in improving access to care, especially in resource-limited countries. ''Telemedicine is the use of digital technologies to provide healthcare at a distance. It allows for the continuity of care, the monitoring of chronic diseases, and the facilitation of coordination between healthcare professionals'' [1].

"The COVID-19 pandemic accelerated its adoption worldwide, due to lockdowns and the need to limit physical contact'' [2].

In sub-Saharan Africa, telemedicine is still little adopted. In Senegal, recent studies show that the main obstacles are the lack of training, weak regulation, and connectivity issues. These obstacles limit the use of digital tools despite the interest of healthcare professionals [3, 4].

The Senegalese context has specific characteristics: the majority of healthcare professionals work in urban areas like Dakar, where connectivity is better, while peripheral and rural regions are less equipped. These inequalities directly influence the

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adoption of telemedicine and its ability to meet the needs of all patients [4].

This study therefore aims to describe the knowledge, perceptions, attitudes, and practices of healthcare professionals in Senegal. We will also identify the main barriers and challenges to the use of telemedicine. Their assessment is essential to guide training strategies, adapt health policies, and strengthen the integration of digital tools in the care pathway.

MATERIALS AND METHODS

Study Design and Period

This is a cross-sectional descriptive and analytical study from September 10 to 19, 2025. The objective was to assess the knowledge, perceptions, attitudes, and practices of healthcare professionals in Senegal in telemedicine.

Population and Sampling

The study included 495 healthcare professionals working in various contexts: doctors, nurses, pharmacists, state midwives, dental surgeons, veterinarians, community agents, and support staff. Participants came from urban, semi-urban, and rural areas.

The recruitment was done voluntarily, through:

- Online self-administered questionnaire designed with Kobotoolbox link: https://ee.kobotoolbox.org/x/ldJpHFDR, shared on WhatsApp groups, LinkedIn ....
- Individual interviews conducted with certain health professionals and reported through the mobile application KoboCollect version 2025.2.3.

No strict exclusion criteria were applied, other than the refusal of informed consent.

Data Collection

The data was collected using a structured questionnaire, including:

- Sociodemographic data: age, gender, profession, place of work, years of experience;
- Knowledge and perception of telemedicine: types, legal framework, sources of information;
- Professional practices: use of digital tools, training received, frequency of use;

Informed consent and respect for ethical rules.

The confidentiality and anonymity of the participants were strictly upheld, and each participant could withdraw at any time without justification.

Studied Variables

- **Demographics**: age, sex, profession, years of experience, place of practice;
- **Related to Telemedicine**: knowledge (yes/no), type of telemedicine known, sources of information, perception of replacement of traditional consultations, legal framework, area of application, tools used, training received, informed consent, frequency and practices of telemedicine.

Statistical Analysis

Statistical analysis the data were analyzed using R version 4.4.0 and Excel. Univariate and bivariate analyses (chi-square tests and Fisher's test) were conducted. The significance level was set at $p < 0.05$. 95% confidence intervals were calculated. Multivariate analyses were considered to identify the factors associated with knowledge and use of telemedicine based on: profession, place of practice (Dakar/outside Dakar), age (<30 years/≥30 years), and years of experience (<5 years/≥5 years).

Ethical Aspects

The study was conducted in accordance with international ethical principles. Informed consent was obtained from all participants before data collection. Confidentiality, anonymity, and the ability to withdraw from the process at any time were strictly upheld.

RESULTS

- General characteristics of the participants:

Out of 495 healthcare professionals surveyed, the breakdown by profession was as follows: 170 doctors, 136 nurses, 58 pharmacists, 52 state midwives, 38 dentists, 5 veterinary doctors, and 33 community agents and support staff.

The data collection was done via:

- KoboToolbox online, with 336 participants (67.9%) having responded via links shared on WhatsApp, LinkedIn and Facebook,
- Individuals interviews recorded on KoboCollect with 32.1 %.

The average age of the respondents was 35.19 years with a standard deviation of 7.48; extremes ranging from 22 to 58 years and a 95% confidence interval: CI95%= [34.5-35,9].

The overall sex ratio (M/F) was 1.33 (figure 1).

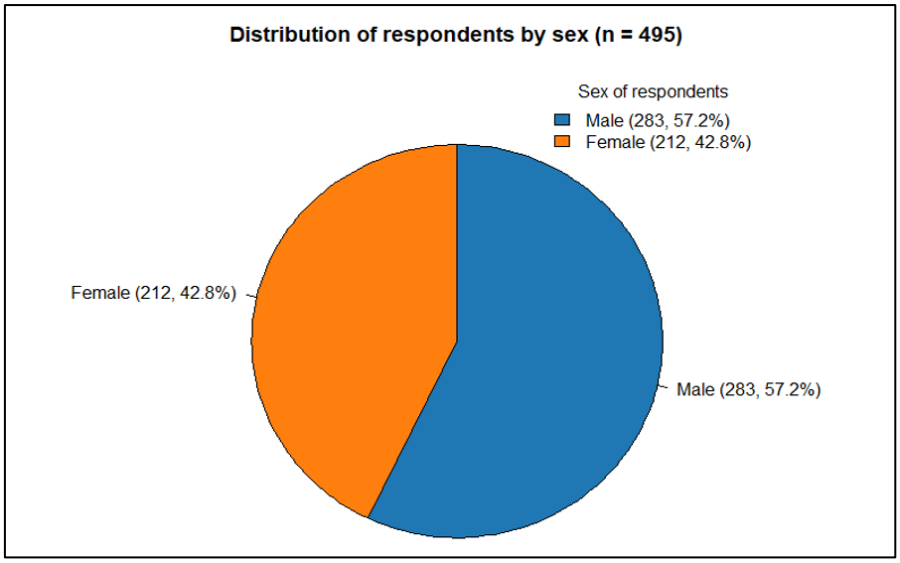

Figure 1: Distribution of respondents by sex

The average professional experience was 7.67 years with a standard deviation 6.0; extremes ranging from 1 to 35 years and a 95% confidence interval: CI 95% = [7,2-8,2].

Out of 492 respondents, 370 (75.2%) were serving in the western area, including 45.7% in Dakar, 10.5% in the center, 7.52% from the eastern area, 4.47% from the north, and 2.24% from the south.

Practitioners worked in health centers (152, 30.7%), 23.8% were in hospitals, 21% in the private sector, 13.7% in health posts, mainly paramedical and community, and 8.08% in faith-based and non-profit organizations.

Knowledge and perception of telemedicine:

Among the participants, 87.5% had already heard of telemedicine. 169 (34.1%) practitioners had learned about telemedicine from a colleague. Other sources of information included scientific journals for 118 personnel, 35 through media, and 18 via other channels.

Regarding the knowledge of different practices, teleconsultation was performed with 392 healthcare professionals, medical tele-assistance with 276, chronic disease telemonitoring, and tele-radiology with 135 healthcare professionals shown (figure 2).

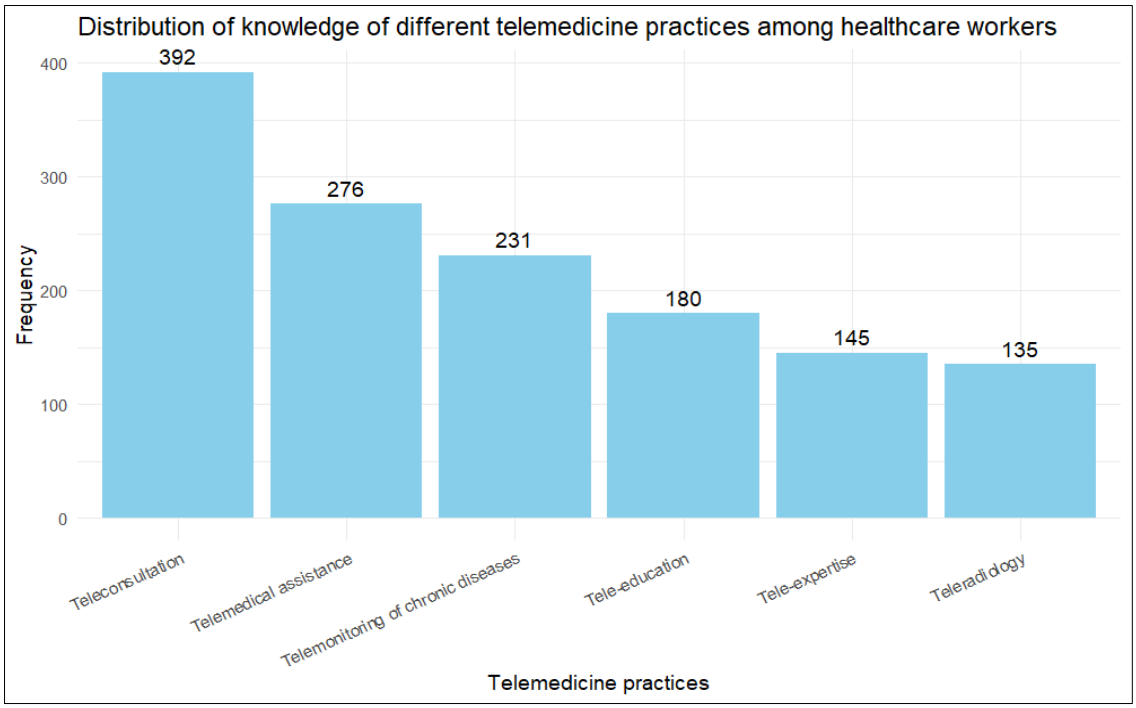

Figure 2: Distribution of knowledge of different telemedecine practices amoung healthcare workers

Regarding the perception of telemedicine, 193 healthcare professionals believed that telemedicine could replace in-person medical consultations, 181 considered that it could only partially replace them, and for 120 it was impossible for this replacement.

Regarding the legal framework of telemedicine in Senegal, only 23.03% (114) were aware of it.

240 respondents believed that telemedicine was more applicable in general medicine, 82 for chronic diseases, 52 for gynecology-obstetrics, 39 for pediatrics as well as mental health.

66.3% (328) of participants viewed telemedicine as remote consultations, 17.9% (89) as an electronic medical record, and 10.9% (54) as a mobile health application.

- Practices and use of telemedecine:

The majority of participants 63.6% (315) were aware of at least one means of telemedicine training. 28.1% (139) had received training: video conferencing (45), e-learning (43).

The majority of participants 84.2% (417) believed that informed consent should be obtained before any procedure. 27.5% (336) had used a telemedicine platform at least once, and 21.8% (308) had conducted a teleconsultation.

The majority of participants (451, 91.1%) had access to a smartphone, computer, or tablet at work. 23.2% (115) used telemedicine occasionally, 65 regularly, 65 others rarely, and 138 had never used telemedicine.

Remote monitoring via digital tools:

387 (78.2%) practitioners have at least used the WhatsApp application to remotely monitor a patient. 73 (14.7%) had used LinkedIn, 57 (11.5%) other social networks, and 102 (20.6%) had never used it. 437 (88.3%) had at least used the WhatsApp application once to share results of paraclinical tests with their colleagues. 46 (9.29%) had used the Instagram application. 88.5% used WhatsApp for remote prescribing and 78.2% for monitoring a patient.

Statistical Analysis and Associations

- Knowledge of telemedicine by profession:

The best-known components were teleconsultation, teleassistance, and telesurveillance. They were significantly better known among doctors and pharmacists ($p<0.05$).

- Training and tools according to the profession:

Medical Doctors had more training in e-learning or DIU ($p<0.05$). WhatsApp remains the predominant tool for all professions.

- Informed consent and experience:

The more experienced participants (>10 years) were more aware of the importance of consent ($p<0.05$).

- Place of practice and perception:

Professionals outside Dakar viewed telemedicine as more necessary ($p<0.05$). Teleconsultation is the most well-known component, especially among doctors. Teleradiology and tele-expertise are less known, particularly among paramedical and community staff (**Table I**).

Table I: Knowledge of telemedicine components by profession

Composante	Doctors n (%)	Nurses n (%)	Pharmacist n (%)	Otters n (%)
Teleconsultation	150 (88,2)	110 (80,9)	48 (82,8)	84 (85,7)
Medical Teleassistance	120 (70,6)	80 (58,8)	40 (69,0)	36 (36,7)
Chronics diseases remote monitoring	100 (58,8)	80 (58,8)	30 (51,7)	21 (21,4)
Distance learning for caregivers	80 (47,1)	60 (44,1)	20 (34,5)	20 (20,4)
Tele-expertise	60 (35,3)	40 (29,4)	20 (34,5)	25 (25,5)
Teleradiology	50 (29,4)	30 (22,1)	20 (34,5)	35 (35,7)

Very few participants received formal training. Doctors are slightly more trained than other professionals. E-learning and video conferencing are the most used methods. This data are illustrated in **Table II**.

Table II: Training received according to profession

Training mode	Doctors n (%)	Nurses n (%)	Pharmacist n (%)	Others n (%)
Video-conference	25 (14,7)	10 (7,4)	5 (8,6)	5 (5,1)
E-learning	20 (11,8)	10 (7,4)	5 (8,6)	8 (8,2)
DIU	15 (8,8)	5 (3,7)	5 (8,6)	9 (9,2)
Others	3 (1,8)	3 (2,2)	1 (1,7)	2 (2,0)

The majority of participants recognize the importance of informed consent, especially in Dakar and among doctors. Respect for consent is less known among paramedical and community staff (**Table III**).

Table III: Informed consent according to practice place and profession

Informed consent	Dakar n (%)	Outside Dakar n (%)	Médecins n (%)	Infirmiers n (%)	Autres n (%)
Yes	220 (97,8)	197 (92,5)	160 (94,1)	120 (88,2)	134 (85,7)
No	5 (2,2)	16 (7,5)	10 (5,9)	16 (11,8)	22 (14,3)

WhatsApp is widely dominant for communication and remote monitoring. LinkedIn and other networks are used much less for remote professional activities (**table IV**).

Table IV: Frequency of use of digital tools

Tools	Never n (%)	Rarely n (%)	Occasionally n (%)	Regularly n (%)
WhatsApp	40 (8,1)	50 (10,1)	100 (20,2)	305 (61,6)
LinkedIn	200 (40,4)	150 (30,3)	100 (20,2)	45 (9,1)
Other networks	250 (50,5)	100 (20,2)	90 (18,2)	55 (11,1)

Telemedicine is seen as beneficial for access to care and patient monitoring, but is still hindered by technical problems and lack of training.

Doctors, experienced participants, those working outside of Dakar, and those who have received training are more likely to know about and use telemedicine (**table V**).

Table V: Factors associated with the knowledge and use of telemedicine

Factor	OR	IC 95%	p-value
Profession (doctor vs other)	2,1	1,4–3,2	0,01
Experience >10 years	1,5	1,1–2,2	0,03
Practice place (outside Dakar)	1,7	1,2–2,5	0,02
Training received	2,5	1,8–3,4	<0,001

Most doctors and pharmacists work in Dakar, midwives are mainly outside Dakar, and paramedical and community professions are more balanced between men and women (table VI).

Table VI: Distribution by profession, sex and place of practice

Profession	Dakar		outside Dakar		Total
	Male	Female	Male	Female	
Doctors (MD)	140	15	10	5	170
Nurses	60	30	20	26	136
Pharmacists	40	5	10	3	58
State midwives	10	30	5	7	52
Dental surgeon	25	5	8	0	38
Veterinarians	4	0	1	0	5
Community agents	11	5	8	5	36
Total	300	90	72	46	495

DISCUSSION

Our study reveals that while most Senegalese healthcare professionals are familiar with telemedicine, its effective practice remains limited by infrastructural, regulatory, and training constraints. These results corroborate those of studies conducted in other African contexts [5, 6].

The predominance of WhatsApp as a tool for informal telemedicine reflects a pragmatic adaptation to local realities, as observed in African countries [7, 8].

However, this practice raises ethical and legal questions, particularly regarding data privacy [9].

The low level of knowledge about the legal framework (23.0%) is a major barrier to the structured deployment of telemedicine. Awareness and training efforts are necessary, as recommended by the WHO [10].

The positive perception of telemedicine as a means of improving access to care, especially in rural areas, is an asset for its development. However, the digital divide persists, requiring investments in infrastructure [11].

Many use applications like WhatsApp, without a clear legal framework. This observation aligns with other African studies. It also contrasts with the experience of pioneering countries such as the United States, Canada, and Norway, where telemedicine is organized and regulated. In the United States, COVID-19 accelerated adoption. In 2021, 37% of adults had a teleconsultation compared to less than 10% before the pandemic, supported by flexible regulations and solid infrastructures. In Canada, several provinces invested early in secure platforms linked to medical records. By 2022, over 60% of family doctors were using teleconsultations. Norway developed a national platform ('Helsenorge') allowing over 70% of non-urgent

consultations to be conducted remotely in 2022. These experiences rely on strong political will, appropriate funding, and integration into the healthcare system [12-14].

In our context, professionals view telemedicine positively, especially for general medicine and chronic diseases. But obstacles persist: low quality of connections, lack of training, use of non-medical tools that raise confidentiality issues. Less than a third of respondents received specific training, which limits the adoption of practices.

Despite this, the results confirm that professionals are ready to embrace telemedicine. To move forward, it will be necessary to invest in training, develop secure local platforms, and establish a legal framework. The experiences of the United States, Canada, and Norway show that this evolution is achievable if the political and technical conditions are met.

Our survey has certain limitations. The majority of participants worked in urban areas, which may mask the difficulties faced by rural areas. Moreover, the declarative nature of the responses exposes it to a possible bias.

Longitudinal studies would be useful to evaluate the evolution of practices.

CONCLUSION

Telemedicine in Senegal enjoys good acceptance among healthcare professionals, but its use remains limited and largely informal. The main obstacles identified are the lack of an operational legal framework, the lack of appropriate training, and the persistence of the digital divide between urban and rural areas.

Telemedicine can only progress with clear rules protecting confidentiality and data security. It is also necessary to strengthen digital infrastructures and integrate telemedicine into training programs. Local teleconsultation solutions must be safe, affordable, and designed to reduce reliance on non-medical applications like WhatsApp. Pilot projects, accompanied by regular evaluations, will ensure sustainable adoption by healthcare professionals.

Thus, telemedicine could become a real lever for health equity and the modernization of the Senegalese health system. It also helps to reduce inequalities in access to care and to strengthen resilience against future health crises.

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