



## Research Article

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## Socio-Economic Impact of Covid-19 pandemic on Outpatient Healthcare Services of Musculoskeletal and Sports Medicine Services in LMIC

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### Abstract

**Background:** The outbreak of COVID-19 has revolutionized the dynamics of entire world. Hospitals are overburdened with increasing numbers of covid-19 patients. Majority of hospitals have suspended their outpatient clinics and elective operative work; a major source of revenue generation. Hospitals are also spending an additional amount on procurement of PPEs to prevent spread of COVID-19 among patients and healthcare workers. These measures have challenged the financial viability and functioning of hospitals. We conducted a retrospective cross-sectional study to assess the impact of COVID-19 on outpatient services of Musculoskeletal and Sports Medicine service line in a tertiary care hospital of LMIC country.

**Methods:** A retrospective study was conducted over a period of twelve weeks from February 1<sup>st</sup> to April 30<sup>th</sup>, 2020. The study duration was divided into two periods; Pre-COVID Era and COVID Era of six weeks each. All patients who visited outpatient clinics during study duration and health care workers were included in the study. Data was collected from Hospital management software system on number of clinics, number of patients, number of procedures, and PPE expenses. Data was analyzed using STATA version 15.0. Median and interquartile ranges were calculated and Wilcoxon rank sum test was applied to assess group differences.

**Results:** There was a decrease in outpatient volumes of rheumatology from 798 to 188 in Pre-COVID to COVID era respectively (p value of <0.001) with consequential 76.4% reduction in revenue. Outpatient clinic data of orthopedic surgery showed the same results; reduction in patient volumes from 4775 to 1696 (p value of <0.001), reduction in number of clinics from 5-6 to 2-3 per day (p value of <0.001) and drop in revenue 64.5% from Pre-Covid to Covid respectively. There was 100% increase in use of PPE with p value of 0.005. The utility of staff was reduced up to 50% in COVID period with p value of 0.001.

**Conclusions:** Covid-19 affected the outpatient clinic services of Musculoskeletal and sports medicine services of a tertiary care hospital, in terms of number of clinics, outpatient volumes, and functioning of healthcare providers. At the same time Covid-19 brought complete transformation in working of outpatient clinics and changed the practices starting from the call to set up an appointment to physical examination.

**Keywords:** Outpatient services; Musculoskeletal and sports medicine; COVID-19; Personal protective equipment; Healthcare providers

**Abbreviations:** SOP: Standard Operating Procedures; PPE: Personnel protective equipment; MSM: Musculoskeletal and Sports Medicine; WHO: World Health Organization; CDC: Centre for Disease Control and prevention; DIPHE: Department of Infection Prevention and Hospital Epidemiology

## Background

The outbreak of Covid-19 has revolutionized the dynamics of entire world. According to World Health Organization (WHO) and the Centre for Disease Control and Prevention (CDC), the Chinese government declared an outbreak of novel corona virus (COVID-19) in December 2019 [1-4]. Since then changes have continued to affect the world economy, working of various institutions, growth, productions and day to day functioning of various industries including health care industry [2,3]. After declaration of COVID-19 as a pandemic on March 11, 2020 by WHO [4], the world continues to innovate and introduce measures to control the spread of this novel corona virus infection. These measures include lockdown, closure of different industries like hotels, restaurants, places of public gatherings, schools, colleges and universities, maintaining social and physical distancing, and essential use of masks. Standard Operating Procedures (SOP) have been developed by governments and implemented forcefully to control the spread of disease [5].

The substantial increase in the number of COVID-19 cases has also become a challenge for Pakistan with low socio-economic resources. On one hand Covid-19 brought unemployment among already underprivileged people that was a major challenge for developing countries; on the other hand Covid-19 was a major problem for health care institutions to cope with over load of Covid-19 patients, requiring extra care in form of intensive care, isolation and quarantine [2,6]. As Covid-19 started to spread across different parts of the world, it caused increase in morbidity and mortality due to its progressive complications involving respiratory tract infection, pneumonia, Acute Respiratory Distress Syndrome (ARDS), systemic infection, increased incidence of pulmonary micro-thrombosis, and multi organ failure depending on the competence of the patient's immune system [7,8].

The first case of COVID-19 in Pakistan was reported on February 26<sup>th</sup>, 2020 [4], that was diagnosed and treated at our institution [1,9]. Following the successful treatment of that case, our hospital being a tertiary care center took the lead role in screening, diagnosis and treatment of patients with Covid-19 due to its international certification (JCIA) and robust infrastructure (ICU, isolation units and negative pressure operation theatres),

trained staff of ICU and elaborate infection control measures). The lockdown in our country was announced on March 13, 2020 [1,9].

Musculoskeletal and Sports Medicine (MSM) service line comprises of two subspecialties, Orthopedic Surgery and Rheumatology. There is a dedicated clinic area in the outpatient clinic building designated as musculoskeletal and sports medicine clinic. There are 12 orthopedic surgeons (11 full time and one part time) and five rheumatologists (2 full time and 3 part time) working together in that clinic. Every day three attending clinic slots are booked as morning clinic from 9am to 12noon, afternoon clinic from 2pm to 5pm and evening clinic from 6pm to 8pm. In every clinic slot orthopedic surgeons and rheumatologists do clinics to facilitate mutual patient care.

Various preventive measures were introduced by MSM service line in collaboration with hospital management in outpatient areas for protection of patients and health care workers. Our hospital, being Joint Commission for International Accreditation (JCIA) recognized center played a leading role in implementation of preventive measures that include: limiting the entry of initial and elective patients and attendants, assigning a dedicated place for the screening and testing of suspected or confirmed COVID-positive patients, maintaining physical and social distancing, use of masks by the patients and attendants and mandatory use of PPEs for all health care workers. Various sessions were held for training of staff in proper use of Personnel Protective Equipment (PPEs), N95 masks, hand hygiene and frequent hand washing and safe transfer of patients.

The source of revenue generation for hospitals and any service line are Outpatient clinics and elective surgeries especially orthopedic procedures of total joints replacement and sports related injuries. Due to implementation of preventive measures the outpatient clinic volumes went down and subsequently revenue generating elective procedures also decreased tremendously [10-12]. These things posed a big challenge for the hospital and MSM service line to cope with burden of monthly salaries and compensations of all health care workers. Covid-19 brought drastic changes in the setup of outpatient clinics of Musculoskeletal and Sports Medicines (MSM) service line. Based on the above changes in our day to day functioning, we retrospectively analyzed the outpatient care operations of MSM service line to see how those changes affected our frequency of clinics, clinic volumes, our health care workers and financial income of service line. We highlight in particular the measures taken by our service line in following areas:

1. Process of registration, screening and initial assessment in clinics
2. Mandatory use of face masks for patient and attendants
3. Consultation and inpatient admission algorithms

4. Introduction of tele clinics
5. Measures to maintain social and physical distancing
6. Use of PPEs by the health care workers
7. Development of SOPs for outpatient orthopedic procedures

**Materials and Methods**

This retrospective observational study was conducted at a tertiary care hospital of Karachi, Pakistan. The duration of study was twelve weeks, which was divided into two periods. The first six weeks were from February 1<sup>st</sup> 2020 to 15<sup>th</sup> March 2020, referred to as the Pre-Covid Era and the second six weeks from 16<sup>th</sup> March 2020 to April 30<sup>th</sup> 2020 referred to as the Covid Era. Lockdown was implemented in our country from 13 March, 2020 onward for six weeks. All the patients visiting outpatient clinics and health care providers (which include doctors, nurses, technicians and unit receptionists in MSM service line) during study period were included. However, trainee doctors, nurses and supporting staff were excluded as they were forbidden to attend clinics.

**Data Collection method and Outcome assessment tool**

Data were collected from Hospital management software system; that included Outpatient Management System (OPMS), Critical Care Management System (CCMS) and Inventory Management System (IMS). The variables were collected through a structured proforma including; number of patient visits in the clinic, number of clinics by each consultant, number of patients (initial, follow up), number of procedures in clinic (like removal of K-wires, external fixators, dressing of open wounds, splints and

applications of casts). Health care worker attendance and absence, number of health care workers (doctors, nurses, and paramedical staff) infected with COVID-19, number of health care workers quarantined, expenses due to the use of PPEs and decrease in number of nursing staff per week, in clinic was recorded in People Soft application. The structured checklist was filled from these various applications that provided real time data.

**Data analysis**

Data were entered in STATA version 15.0. For quantitative descriptive analysis, median and interquartile ranges were calculated. Wilcoxon rank sum test for two independent samples was applied to assess group difference and p value of  $\leq 0.05$  was considered statistically significant.

**Results**

We compared the data of Pre-Covid with Covid era in terms of number of clinics per day, number of patients (initial and follow up), procedures and no shows despite pre-bookings. This data were analyzed separately for Rheumatology and Orthopedic Surgery.

The number of rheumatology clinics were reduced significantly comparing both time periods with p value of  $< 0.001$  (Table 1). Similarly the numbers of patients volumes both initial and follow up were significantly reduced ( $p < 0.001$ ). With drop in clinic volumes, the outpatient rheumatology procedures went to zero, that had significant financial implications. The total number of patients seen in Pre Covid era of rheumatology section were 798 while only 188 patients were seen in Covid era; 76.4% decrease in the clinic volumes with a consequential 76.4% reduction in revenue generation.

S#	Variable	Pre-COVID ERA Median (IQR)	COVID ERA Median (IQR)	P-value
1.	Total no of Rheumatology Attending clinics per day	2 (1-3)	1 (0-1)	<0.001
2.	Rheumatology initial patients per day per attending	8 (4-14)	0 (0-4)	<0.001
3.	Rheumatology Follow-up patients per day	8 (4-13)	1 (0-5)	<0.001
4.	Total no of Rheumatology procedures per clinic	1 (0-3)	0 (0-1)	0.0042
5.	Rheumatology no show, brief visit (for reports), and no charge patient visits	7 (3-11)	1 (0-5)	0.0001

**Table 1:** Differences in outpatient health care services of Rheumatology between Pre-COVID and COVID Era.

Looking at the outpatient clinic data of orthopedic surgery, the figures were more or less same as the rheumatology clinic. The numbers of orthopedic clinics were reduced significantly ( $p < 0.001$ ). The patients volumes were also reduced significantly for both initial and follow up patients ( $p < 0.001$ ). Total number of orthopedic procedures done in outpatient clinics including removal of K wires, external fixators, aspiration and intraarticular injections were also reduced significantly in Covid era. Table 2 show the differences between Pre-COVID and COVID era in term of orthopedic outpatient services. The total number of outpatient seen in Pre Covid era of orthopedic section were 4775 and only 1696 patients were seen in Covid era, 64.5% reduction in clinic volumes with significant reduction in revenue generation.

S#	Variable	Pre-COVID ERA Median (IQR)	COVID ERA Median (IQR)	P-value
1.	Total no of Orthopedic Clinics per day	9 (7-10)	4 (3-5)	<0.001
2.	Orthopedic initial patients per day	33 (28-41)	7 (3-10)	<0.001
3.	Orthopedic Follow-up patients per day	41 (30-51)	20 (15-28)	<0.001
4.	Total no of Orthopedic clinic procedures per day	16 (10-27)	10 (6-13)	0.0006
5.	Orthopedic no show, brief, and no charge patient visits	30 (23-36)	15 (12-19)	<0.001

**Table 2:** Differences in outpatient health care services of Orthopedic Clinics between Pre-COVID and COVID.

Looking at the use of PPEs, there was 100% increase in use of face masks, N95 masks, shields, gowns and shoe covers ( $p=0.005$ ). The use of hand sanitizer increased with 100% compliance in hand washing as shown by audit report of Department of Infection Prevention and Hospital Epidemiology (DIPHE) (Table 3). The use of number of gloves remained same as number of outpatients procedures went down in rheumatology and orthopedic both sections.

S#	Variable	Pre-COVID ERA	COVID ERA	P-Value
1.	Total Gloves used /Day	0 (0-300)	0 (0-300)	0.6112
2.	Total Masks+N95 used/ Day	0 (0)	0 (0-50)	0.0136
3.	Total Gown, Caps, Face shield, Shoe Cover and Sanitizer used/ Day	0 (0)	0 (0-1)	0.1681

**Table 3:** showing difference in use of PPEs between Precovid and Covid era.

Due to decrease in number of orthopedic and rheumatology clinics per day, the utility of staff and health care workers was reduced and working hours were diminished as seen in table 4. The total number of staff was reduced to 50% in Covid period (12) as compared to pre-covid (21) ( $p=0.001$ ). The health care workers availed their earned leaves in Covid era significantly ( $p=0.0001$ ), to spread out their leaves planning for busier months ahead.

S#	Variable	Pre-COVID ERA Median (IQR)	COVID ERA Median (IQR)	P-Value
1.	Total Staff/Day	21 (18-23)	12 (1-16)	<0.001
2.	Sick Leaves/Day	0 (0-1)	0 (0)	0.0004
3.	Casual leave, Earn leave, due off/ Day	0 (0-1)	5 (0-7)	<0.001

**Table 4:** Showing difference between utilization of staff in Precovid Vs Covid era.

The protocols of screening, registration, initial assessment by nursing staff, seating arrangement in waiting areas maintaining social distances, examination by consultant, pattern of notes writing and patient briefing were all changed from a close contact to physical and social distance of SOPs. The use of mask, face shields and gowns used by health care workers was hallmark of outpatient care. Similarly the patient and attendants were also given masks during this whole process of outpatient consultation. These changes can be seen in table 5.

	Pre- Covid	Covid
Screening for Covid-19	No such screening was done None	Mandatory Screening for all incoming outpatients through a tool
Registration	Free Entry to Registration desk	Only one person allowed for registration
Use of Masks	No Masks	Mandatory masks for all patients and attendants

Social Distancing	None	Marked stations on floor for social distancing
Hand Hygiene & washing	99% compliance	100% compliance according to DIPHE report in Covid era
Resident presence	Resident allowed in clinic	No Resident allowed in clinic
PPE, Gowns Face Shield & Masks	Used as requirement per patient	Mandatory for health care workers
Patient Examination	Done by students, Resident & Consultant	Done by consultant only
Tele-Clinic	Few and only for out of town patients	Daily 2-3 Tele Clinics
Admission procedure for Elective	No Covid test	Mandatory Covid PCR test for admission
Admission for emergency	Direct admission, No isolation	Admission in isolation and mandatory PCR test for Covid if patient planned for general anesthesia
Orthopaedic procedure in clinic	PPEs a per patient requirements	All procedures done with mandatory PPEs
Disposal of waste	Spaced out as per patient requirements	After every procedure useable items disposed in hampers bags

**Table 5:** showing the differences in outpatient processes in Covid era.

During Covid era one of our nursing staff turned COVID positive and was isolated at home for 45 days. In this regard, we initiated contact tracing for exposure of those who were in direct contact with affected staff. While considering the exposure, we sent our 8-nursing staff for covid-19 PCR testing and all were found negative, a best practice to prevent the spread.

## Discussion

There was complete transformation of outpatient clinic of Musculoskeletal and Sports Medicine (MSM) in terms of practices and infrastructure to prevent the spread of Covid-19 among patients and across our health care workers. The numbers of outpatient clinics were reduced significantly in both rheumatology and orthopedics. The entries for elective patients was restricted and only follow up, postoperative and semi-emergent patients were entertained in the clinics that resulted in significant decrease in outpatient volumes of service line. Due to above measure the elective orthopedic work went down to negligible numbers that was a big financial hit to private university hospital setting. It ultimately decreased the monthly earnings of faculty members of service line on one hand. On the other hand maintenance expenses of clinics went up due to use of PPEs, (mandatory use of masks, shields, gowns, caps, shoes cover, soaps, sanitizers, and gloves).

According to a recently published viewpoint in JAMA [12], Khullar raised questions regarding financial viability of private sector hospitals as outpatient clinics were closed and elective work was postponed or went to zero; a main source of revenue generation for private hospitals. To the best of our knowledge none

of the private hospital has published data regarding the fall in their revenue generation. To our knowledge this is one of the first few reports to highlight the drop in finance of a MSM service line of a tertiary care private hospital; innovating payment structures to pay the monthly salaries of healthcare workers while preventing layoffs. Similarly report of Common Wealth Fund [10], showed a significant dip in outpatient visits to 60% because of Covid-19 pandemic. Similarly the outpatient volume of our MSM service line went down 75% in rheumatology and 66% in orthopedics that is quite significant to give a financial dip in our revenue generation. The American Hospital Association [11], pointed out unprecedented financial pressure faced by the private hospitals and has pointed out need of help from Government, agencies and personal donations.

With substantial reduction in earnings, the hospital management decreased the pay of all health care workers by 20% in the consultant category and 10% in the admin level whereas rest of the deficit was compensated by the hospital for three months period of time from April to June, 2020. We got only one staff of outpatient clinic infected with Covid-19 who went into isolation for 3 weeks and total leave of six weeks to become Covid-19 free. The hospital bore full medical expenses of treating all COVID positive employees. Similarly eight staff members who were exposed to the infected staff were sent on quarantine for two weeks and their PCR for Covid-19 turned out to be negative. Low volumes during Covid-19 pandemic upsurge enabled our clinic staff to avail their earned leave to ensure staffing during the normalcy plan. Reviewing the international data, the involvement of health

care workers and morbidity is variable. In one of the study from Italy [13], Carla Felice et al found 18% of the health care workers were infected with Corona virus. We had just one staff involved who has recovered well. With outbreak of Covid-19, all above financial losses, and sufferings of health care workers were born by the MSM service line and hospital in order to facilitate patient care, protect our health care workers, and prevent the spread of Covid-19.

### **Screening measures for outpatient Clinic**

We used the DIPHE (department of infection prevention and Hospital epidemiology) formulated COVID-19 guidelines for screening, registration, assessment and physical examination of all incoming patients to MSM clinic. Other measures implemented were reduction in number of clinics per day, reduced number of patients (follow up and emergent cases) limited entry of attendant (one attendant per patient), wearing of masks by patient and attendant and maintaining social distance. A dedicated screening counter was established outside the clinic run by a trained nursing staff through a structured COVID-19 screening tool. All these measures were implemented according to international guideline [14-17]. If a patient was identified with symptoms, like cough, sore throat, fever, shortness of breath and positive travel history from abroad, he/she was directly shifted to covid-19 testing area. This screening tool is constantly being updated according to the guidelines of CDC and WHO and staff is constantly being trained and upgraded regarding Covid-19.

### **Process of registration and Assessment of patients**

The process of registration of patient was made strict and exclusive. Only patient's attendant or patient (if he/she was alone) was allowed to approach registration counter. There was mounted glass between the receptionist and attendant/patient, with both wearing masks. Following registration process, patient proceeded to assessment room where after identification and verification of the patient and the medical record number, his/her vitals and body weight were recorded in the Medical chart. Thereafter patient was requested to wait in the waiting area where seats were arranged in a manner to ensure social distance is maintained. The whole process was followed as per CDC guidelines to prevent spread of Covid-19 infection [17].

### **Consultation and admission**

Once patient was taken in the consultation room, the attending completed a history and physical in the presence of nursing staff. Residents were excluded from the clinics. Examination by the consultants was done using appropriate PPE as per the hospital guidelines for outpatient areas which included wearing gloves, disposable gown and face shields. Proper hand hygiene techniques were followed after every patient contact [14-16]. If a patient required admission for surgery, the patient was

advised to get a PCR test (Covid-19) and surgery was planned accordingly. If patient required urgent surgery, he/she was taken to negative pressure operating room followed by admission in isolation to await PCR test result. Once PCR was reported, patient was kept in isolation in case of positive test. If test was negative then patient was shifted to routine ward/semiprivate/private room according to the request for place of admission.

### **Introduction of tele consultation**

Telemedicine was introduced in MSM service line two years earlier but that was for patients from out of town. In the COVID Era, tele medicine played a vital role in facilitating care for postoperative patients, follow up and those patients requiring semi-urgent care. Social networking tools WhatsApp, Skype and Zoom were used in tele clinics [18]. This freed up space in clinic waiting area for patients and one accompanying attendant, allowing appropriate physical and social distancing. Less number of patients in clinic facilitated to reduce total number of ancillary health care workers required to run the physical clinics. Nursing staff were trained for tele-consultations and assigned to assist consultants during these encounters. Patients were encouraged to use E-clinics whenever possible.

### **Changes in clinic area**

In outpatient clinic, certain measures were taken to avoid cross infection among patients and health care workers [14-17]. Firstly, a designated room was assigned for proper donning and doffing of personal protective equipment. The patient's chair, examination couch and doctor's desk were spaced appropriately to ensure social distancing. Appropriate distancing protected both the patient and health care workers with limited direct contact as per patient requirement. As the virus can also spread through contaminated objects and surfaces, patient confidential records were kept outside the examination room and documentation was done after patient consultation.

### **Mandatory Use of personal protective equipment and extra cost**

It was mandatory for all health care workers to use Personal Protective Equipment (PPE) – Face mask, Gloves, Goggles, Eye shield, Respirators, N95, during the clinic timings to prevent spread of infection and cross contamination. Due to COVID-19, availability of PPE was another area of concern. The increased consumption created a significant shortage of supplies and the hospital has faced some difficulties in arranging PPE due to national and international shut down. Our consumption of face masks, hand sanitizers, goggles, N95s, gloves increased but hospital had to spend extra money to procure these PPE to save our health care workers, patients and their attendants coming to hospital. This was an extra financial burden on a private hospital, as pointed out in various recent articles about the financial viability

of private sector Hospitals [11,12].

### **Social and physical distancing**

Social distancing is one of the main ways to prevent the spread of covid-19, by maintaining a distance of at least two-meters (6 feet) from other individuals and avoiding large gatherings [14,15]. In outpatient clinics, number of clinic were reduced from 5-6 to 2-3 per slot (slot means session of 4 hours from 9am to 1pm or 2pm to 6pm) to ensure physical distancing., The number of attendants visiting the hospital was reduced to one patient one attendant policy. Various other physical distancing strategies implemented were; floor marking to keep people at safe distances, rearrangement, and reduction of chairs in each examination room, and removal of cushions/seats in the waiting area to maintain the required distance among patients and their attendants.

### **Deployment of workforce**

With imposition of lock down, the number of elective patients of MSM service line decreased to almost fourth third; so number of health care assigned in the clinic were reduced to minimum clinic functioning. By implementation of that policy we reduced the exposure of health care workers. The medical students, trainee nurses, and residents were excused from the clinic to reduce the exposure, overcrowding and spread of disease. The total number of clinics performed by each consultant was reduced. Before Covid-19, there were three slots: morning, afternoon and evening. But due to covid-19 and lock down in the country after 5pm, evening slots were closed. Consultants also limited their number of clinics from 5-6 per week to 2-3 per week during the COVID era.

### **Conclusion**

Covid-19 affected the outpatient clinic services of MSM service line of a tertiary care hospital, in terms of number of clinic, outpatient volumes, and procedures of clinic which were reduced to almost one third of normal functioning clinics. These reductions caused huge loss in the earnings of hospital and challenged the financial viability due to purchase of extra PPE for staff and patients; structural changes to incorporate COVID patients and the use of PPEs was increased 100%. The hospital was forced to reduce the monthly salaries of higher grade health care workers, ensuring that 77% of staff working at the bedside level in the lower salary brackets did not get any pay cut. The utility of staff, working hours and numbers of health care workers were reduced in the clinics due to less number of clinic and patients. Daily tele clinic was started that is growing with passage of time. Overall Covid-19 pandemic has brought complete transformation in working of outpatient MSM clinic with changed practices starting from patient registration to physical examination and counselling of patients.

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