



Challenges Facing Local Authorities In Light Of The Corona Pandemic And Its Relationship With The Central Government In Palestine

Shaher Obaid

Faculty of Administrative and Economic Sciences
Al-Quds Open University, Palestine

ABSTRACT

The research seeks to give a detailed description of the current state of affairs within the local authorities in Palestine. Notably, the issues that are explicitly addressed are how the pandemic has affected the local authorities; capacity to offer essential services to the citizens. A cross-sectional study involving senior employees at Al-Bireh Municipality, the citizens from Al-Bireh Municipality and head of the Emergency Committee in Palestinian Cities and villages was applied to help gain a proper understanding of the extent to which the pandemic has negatively impacted the local authorities' abilities to offer services to the citizens. The results have shown that the pandemic has limited delivery of crucial roles such as environmental services, water services, and solid waste elimination, among others. Additionally, the challenges facing the local authorities in the face of this pandemic have been highlighted as shorted finance, human resources and necessary equipment. Finally, a recommendation section is included to address some of the measures that the local authorities can implement to prevent the effects associated with the occurrence of the pandemic.

Keywords: Local Authorities; central government; Corona Pandemic; Palestine.

INTRODUCTION

Palestine is a developing country in the Middle East with many challenges including social, political, cultural conflicts. The most pronounced challenge facing Palestine is the occupation of the Palestinian territories. The challenges inhibit economic development and government service delivery to the citizens. Besides, the existing challenges, Palestine faces the challenge of COVID-19, the global pandemic reported in all the other countries. The Palestinian government has three levels of administration. The main administrative authority is the national government, under which smaller administrative units including municipalities, cities, village councils fall. The local government units interact directly with the citizen's service administration and implementation of national government policies. The Palestinian Basic Law grants the local authorities twenty-seven basic services delivery mandates. The services include among other provisions of clean drinking water, solid waste management, environmental health services, electricity and lighting services, and wastewater management (Nicastri et al., 2020).

The local authority services lie under the public rights and liberties category, which confirms the importance of uninterrupted delivery. The centre of local authority functionalities is maintaining public health to prevent disease outbreak and enhance healthy living in the country (Lai et al., 2020). The local governments work in collaboration with the national government to identify, manage, and control adverse public disasters, pandemics, crises like the current COVID-19. Invoking the Palestinian Basic Law provisions, the local governments are the pillar in the implementation and administration of the fundamental services to the citizens. However, service delivery depends on government stability, capacity to handle the challenge as well as the magnitude of the challenge at hand.

Presentation Of The Research Problem

Amid the global COVID-19 outbreak, Palestine reported the first case of the disease on the fifth of March 2020. The action plan to minimize the spread of COVID-19 in Palestine includes coordinated action by the national government as well as the local authorities. The national government drafted an action plan and preventive measures while the local governments played the role of implementing the measures. The Palestinian local governments have the mandate of providing essential environmental services that limit the spread of COVID-19 in the local population (Farneubun, 2020). The environmental services include spraying and sanitization of public places like bus stations, and stadiums. Besides, the local governments should provide hand sanitization and handwashing sites at convenient places especially in towns and cities.

The mandate requires more water volume than the installed capacity and hence it is challenging to effectively execute the mandate. Additionally, the provision of handwashing soaps and sanitizers in strategic places requires a higher budget citing the emergent nature of the public health concern. The implementation of safety measures to prevent COVID-19 is both a social and health mandate of the Palestinian local governments. The local governments are also charged with the mandate of marking public places with paint to indicate the social distancing for people in public places. The COVID-19 response strategy adds more work to the local government, which may hinder effectively serviced livery to the population. The possible challenges include financial constraints, shortage of labour, water shortage, limited health facilities among many other challenges witnessed in many other countries.

The research problem is thus the implication of the COVID-19 pandemic on Palestinian local authorities' service delivery. The research analyses the COVID-19 challenge and how the local governments in Palestine deploy strategic measures to control the public issue.

Purpose Of The Research Paper

The purpose of the research paper is to unveil the challenges Palestinian local governments face in controlling COVID-19 as a public health issue. The research identifies the roles of the Palestinian local governments in ensuring public welfare and the challenges posed by the Nobel-Corona Virus disease service delivery process. The research focuses on the smaller administrative units in Palestine and reflects on the wider impact of COVID-19 on the national government as well.

CONCEPTUAL AND THEORETICAL FRAMEWORK ILLUSTRATING THE CHALLENGES AFFECTING THE LOCAL AUTHORITIES

The main argument in this paper is that the corona virus has had many negative implications on local authorities in Palestine. The pandemic has limited basic service delivery due to both financial constraints and risks of contracting the disease in places of work. COVID-19 mitigation strategy in Palestine limits the number of people who should work in one office and hence some local authority workers may not deliver on their work effectively. Additionally, the local authorities should provide more services following the World Health Organization requirements to limit the spread of the disease. The Palestinian local authorities organize and fund spraying of public places and coordinate the safe collection, movement, and disposal of medical equipment used in the diagnosis and handling of COVI-19 patients. The local authorities provide basic health services which include construction and equipping clinics and community health centres. Palestine requires more hospitals, clinics, and health centres due to the patients diagnosed with COVID-19. The local authorities are overwhelmed by the magnitude of service delivery and are on the brink of collapsing. The latter justifies that Palestinian local governments face many challenges in delivering on public health constitutional provision. The Palestinian central government coordinates the national response plan on the pandemic and hence it assumes the central role in funding and execution of the planned public health emergency response plan.

Thesis statement

COVID-19 pandemic creates public health and financial crises in both local authorities and the entire Palestinian government.

Research Questions

1. What are the implications of COVID-19 on service delivery in Palestinian local authorities?
2. How has COVID-19 pandemic affected the functionality of local authorities?
3. How can the local authority effectively respond to COVID-19 pandemic?

LITERATURE REVIEW

COVID-19 is one of the most research topics over the eight months since the first case of the pandemic was reported in Wuhan, China. The topic has been researched by institutions as well as individuals in a bid to get better inside on disease pathophysiology and the factors promoting spread. Research works focus on both the implication of the disease on healthcare systems, global economy, specific countries, as well as administrative units. The research on the challenges facing local authorities amid the corona pandemic in Palestine is related to many other research topics on implications of the pandemic on individual countries, cities, municipalities, and communities. folio analyses the challenges the local as well as local governments face in combating the Corona virus disease in Middle East countries including Palestine 2020).

The author points out that the central governments in the countries have limited financial resources to fund an emergency of the magnitude of COVID-19. Research has it that most Palestine economy is weak to contribute the money required to effectively implement an underlying response strategy. According to research, the intervention strategies to halt the spread of the coronavirus disease have a financial, cultural, social, and economic implication on all populations. The Palestinian local authorities face the challenges of balancing between the implementation of the intervention strategies and maintaining a functional society. For instance, the pandemic

intervention strategies according to the WHO include shutting down cities with adverse case reporting, the secession of movement, isolation, quarantine, and treatment of positive cases (WHO, 2020). The measures do not go well with members of the public citing health challenges like fatigue, poor psychological health, and related personal wellbeing concerns.

The Palestinian central government has also rolled about national strategies in line with the WHO recommendation to limit the spread of the virus (2020). According to Anwar et al., the local authorities implement national government strategies and policies (2020). The Palestinian local authorities spearhead the implementation of the COVID-19 management plan in respective administrative units. The implementation of an intervention strategy like regular spraying of bus stops and related amenities attracts a relatively high cost. Palestinian authorities have limited financial capability to fund the intervention strategy and hence the inadequacy in the implementation of the strategy. The installation of handwashing points in Palestinian cities and strategic points is the role of the local authorities under the central government funding. Additionally, the WHO recommends the installation of automatic body sanitization units especially in crowded municipalities (2020).

The recommendation is inadequately implemented in local administrative unities in Palestine citing limited financial capacity according to Zhang et al., (2020). Besides, the implemented measures like the installation of handwashing sites public places attract other challenges to the local authorities. Zhang et al (2020) note that the world straggles to safely dispose of wastewater from sanitization and handwashing sites. The wastewater could be infected with the COVID-19 and hence poor disposal can lead to further spread.

According to Rowan and Laffey local hospitals and community health centres are in the frontline in the acquisition of COVI-19 infections statistics in any population (2020). The local health centres fall under the management of the Palestinian Ministry of Health. The local authorities should ensure an adequate supply of PPEs and drugs to treat COVID-19 symptoms. However, the world has witnessed an acute shortage of PPEs including body covers, safety gloves, and masks (Wang et al., 2020). The shortage also affects the local administrations in Palestine, inhibiting the acquisition of COVID-19 statistics and treating diagnosed patients effectively. Health centre workers in local health facilities are exposed to the virus in such circumstances which increases the risk of spread. The coordination of health services in Palestine takes the tree tier model.

The local authorities implement the drawn guidelines on COVID-19 but other bodies including the Ministry of Local Government, and civil society are key in the formulation of effective working principles (Imperiale and Vanclay, 2020). The local authority employees are members of the civil society which also adheres to some WHO recommendations on limiting COVID-19 spread. Civil society limits the number of citizens working in the COIVID-19 era citing requirements for limiting movement into and out of places of work. The measure affects the local authority service delivery to the citizens. The local authorities form the foundation of the fight against the COVID-19 pandemic. The WHO director in Palestine, Dr Gerald Ruchenswab, recognized that the COVID-19 preventive measures are population-based and hence the local authorities implement the WHO, as well as the national guidelines in limiting the spread of the disease (WHO, 2020).

However, the WHO official notes various challenges in the initiative including financial challenges and the Israeli occupation which limits Palestine's government policies. Goel et al., notes that restriction of movement in the COVID-19 era limit the local authorities serviced livery to the citizens (2020). The challenges facing the Palestinian local authorities in the COVID-19 era are related to national government policies as well.

The national government declared a state of emergency in the country limiting activity in villages and cities in the country. The health service delivery in the country is dependent on the coordination of the government, local authorities, and civil society (Gopalan and Misra, 2020). The COVID-19 crisis makes it hard for the three interrelated bodies to work effectively amid limited movement, minimal employees at every instant, and increased operational cost in delivering service to citizens. The local authorities need more resources to build and maintain quarantine centres for suspected COVID-19 patients...Sources indicate that the construction and maintenance of isolation centres is a major challenge globally, which applies to Palestine as well (Khanna and Honavar, 2020).

The Palestinian government thought the local authorities implemented a preventive strategy that calls for more funds to install prevention and control facilities, employ more health workers, construct hospitals and equip the health centres as well as the employees in the frontline (Ogunleye et al., 2020). Research shows that many Palestinians are on the brink of starvation and hence the local authorities need to take care of the welfare of the vulnerable population (Lee et al., 2020). The local governments, which comprise of municipal and village councils lead the implementation of COVID-19 measures and ensuring implementation of guidelines like social distancing in public areas and gatherings as reporting the social welfare situation to the government through the Ministry of Local Government (Ameh, 2020). The COVI-19 containment is implemented under the Emergency Committee in Palestinian Cities and villages committee which is highly informed of the matters of concern in the containment strategy. However, many sources report various challenges affecting the functionality of the local authority backed committee in achieving the planned outcome.

METHODOLOGY

Research Design

In addressing the research problem, this research adopted a cross-sectional study design in which data was collected using both quantitative and qualitative methods. The cross-sectional design is commonly referred to as snapshot as it involves collecting data at only a specific point in time without doing any further follow-up. The design is more appropriate for a short-term study like in the current case. The research process involved the collection, analysis, and integration of qualitative and quantitative data to help answer the research questions.

Population and Sampling Strategy

The study participants included senior officials from Al-Bireh Municipality, the citizens from Al-Bireh Municipality and head of the Emergency Committee in Palestinian Cities and villages. Participants were selected using a purposive sampling strategy. As outlined in the literature, purposive sampling involves selecting individuals with the required expertise and experience to take part in the study (Venkatesh, Brown & Sullivan, 2016). For instance, the municipal authorities and local administrators have a reliable formation on the challenges they encounter in delivering

health and social services to the Palestinians in the COVID-19 era. The head of the Emergency Committee in Palestinian Cities and villages as the official plays a significant role in the coordination of service delivery to citizens and implementation of the COVID-19 measures. Lastly, the citizens from Al-Bireh were purposively selected based on their understanding of how the pandemic has impacted on the service delivery by the Palestine Authority. The sampled data for the interview included 10 Al-Bireh municipality officials and 50 citizens in Al-Bireh municipality. Besides, 10 members of the Emergency Committee in Al-Bireh were recruited to take part in the study. The researcher believed that these groups of participants would provide reliable information on the challenges affecting the Palestinian local authorities in the on-going COVID-19 crises.

Instrumentation

Data was collected using semi-structured questionnaires (attached in appendix 1). The semi-structured questionnaires were designed to help collect information relevant to challenges faced by the authority in delivering services to the citizens. The questionnaire mainly had Ye/No questions that relatively consume less time to answer. It is important to note, however, that the questionnaires were developed by the researcher after reviewing the available literature and the research questions that needed to be answered. Moreover, the research utilized secondary sources like Google Scholar to draw the most recent data on COVID epidemiology, containment challenges, and administrative challenges in the COVID-19 era (Rowan and Laffey, 2020).

Data Collection Procedures

The researcher sought the approval of the individual participants to take part in the study. Upon consent by the respondents to participate in the research, the researcher administered the questionnaire to obtain both qualitative and quantitative data. Given that this research had adopted a purposive sampling technique, the researcher reached out to individual participants and administered the questionnaire at their own convenience. It is important to note, however, that the data collection process strictly followed ethical considerations of conducting research to ensure quality and credible data.

Ethical considerations

The researcher strictly adhered to the ethical considerations of researching while engaging with the respondents (Creswell, 2014). Firstly, potential respondents were given the content and purpose of the survey to make individualized decisions on whether to participate or not to participate in the study. The researcher then made full disclosure of the research's intention and how the respondents would benefit from the research. Most importantly, the participants were informed of their freedom of choice to withdraw from the study at any given point in time. They were equally assured of the confidentiality and anonymity of data collected from them.

Data analysis

All the data collected were first summarized and then entered into computer software, Statistical Package for Social Sciences (SPSS), version 21.1 for the purpose of analysis. Simple descriptive statistical analysis was done, mostly involving measures of central tendency and information presented in the form of figures, frequencies and tables to help answer the research questions.

RESULTS AND FINDINGS

The research findings include a comprehensive view of the reviewed secondary sources as well as an analysis of the responses from the conducted interview. Secondary sources indicate that the Palestinian government is incapacitated to fund the COVID-19 response strategy citing the large budget required in the country's ministry of health (Abd El-Aziz and Stockand, 2020). The ministry of local government also requires millions of dollars to implement the ministry of health guidelines in controlling COVID-19 spread.

Research shows that Palestine has handed a larger national debt and hence cannot borrow a lot of money from international money markets to cushion for the COVID-19 emergency. Besides, the Palestinian local authorities find it difficult to deliver health services to the citizens in the wake of increasing demand for new hospitals, more personnel, hospital equipment like ventilators, and provision of PPEs to the working employees (Singh, 2020). The local authorities report that limited movement inhibits service delivery like installation and maintenance of water and sewerage services. Additionally, the local authorities have hand many challenges in the safe disposal of wastewater which includes water form hand washing points (Farneubun, 2020). Strategic CIVD-19 management approaches limit the number of employees working in a specific role or area and hence the local authorities have challenges in delivering basic services like electricity installation social services like adherence to social distancing and wearing of masks in public places.

According to the interviewed persons, the most pronounced challenge affecting the Palestinian local authorities is financial inadequacy which has resulted in stalled service delivery in municipalities like Al-Bireh. The citizens reported that COVID-19 has changed their way of life including limited movement and lesser job opportunities due to closure of major economic sectors like transport and local trade markets. The local resident's responses are as shown:

Table 1. Local residents' responses.

Responses			
Questions	Yes/ Positive	No/ Negative	Neutral/ I don't know
How has COVID-19 changed your life?	4	41	5
Do you think the Palestinian government and local authorities have adequate funding for the COVID -19 emergency plan?	6	44	0
Based on your assessment, are satisfied with local authority service delivery?	4	46	0
Do you think the local and central government are on the right track in containing COVID-19?	10	35	5
Are you satisfied with sanitization measures instituted to limit COVID- 19 spread?	15	35	0
Do you think the local authority is swift in implementing COVID-19 measures?	7	39	4

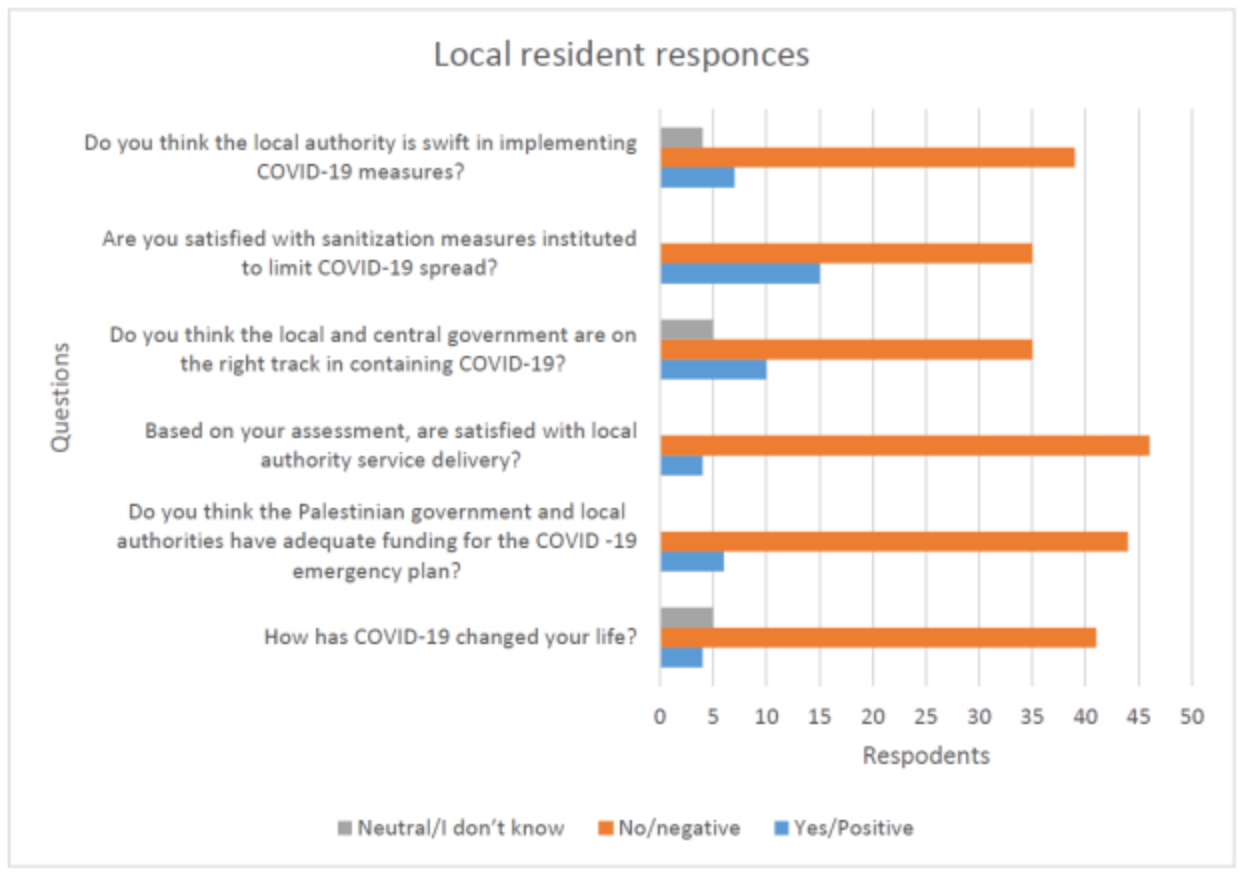


Figure 1: Local residents’ responses chart

Table 2: Emergency Committee responses

Responses			
Questions	Yes/ Positive	No/ Negative	Neutral/ I don't know
How has COVID-19 changed your life?	1	9	0
Do you think the Palestinian government and local authorities have adequate funding for the COVID -19 emergency plan?	3	7	0
Based on your assessment, are satisfied with local authority service delivery?	2	7	1
Do you think the local and central government are on the right track in containing COVID-19?	2	8	0
Are you satisfied with sanitization measures instituted to limit COVID- 19 spread?	3	6	1
Do you think the local authority is swift in implementing COVID-19 measures?	2	8	0

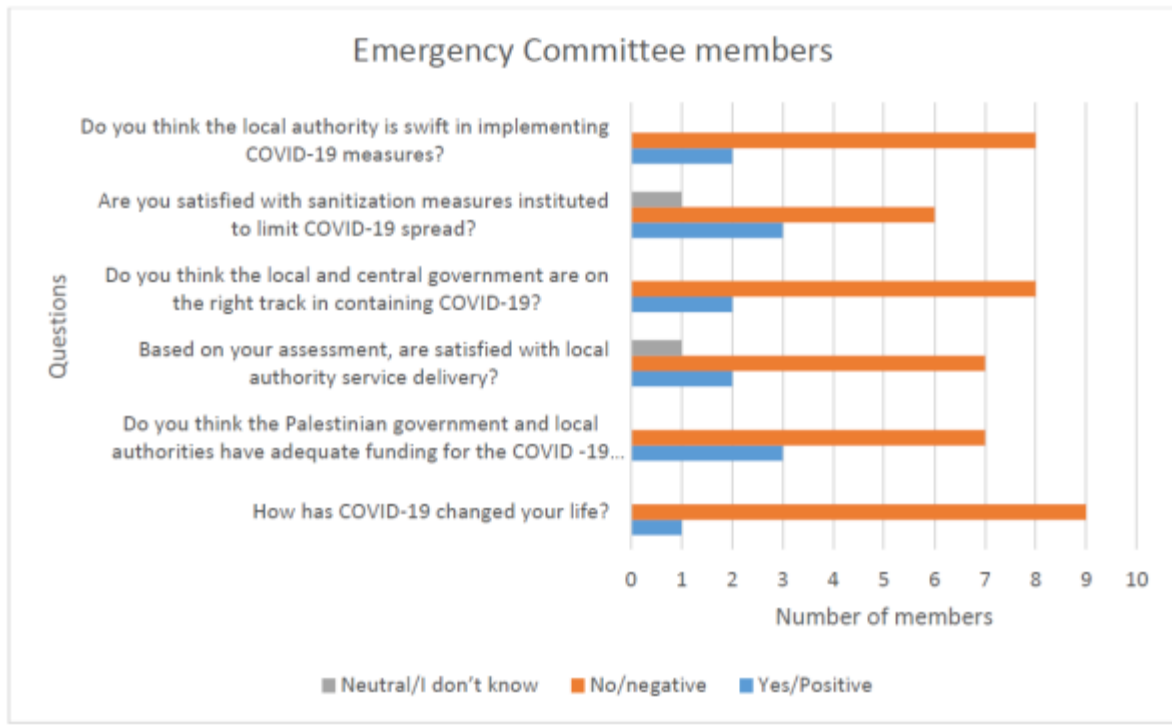


Figure 2: Emergency response committee responses chart

Table 3: Al-Bireh administrators' responses

Responses			
Questions	Yes/Positive	No/ Negative	Neutral/ I don't know
How has COVID-19 changed your life?	2	8	0
Do you think the Palestinian government and local authorities have adequate funding for the COVID -19 emergency plan?	1	9	0
Based on your assessment, are satisfied with local authority service delivery?	3	7	0
Do you think the local and central government are on the right track in containing COVID-19?	2	8	0
Are you satisfied with sanitization measures instituted to limit COVID- 19 spread?	2	8	0
Do you think the local authority is swift in implementing COVID-19 measures?	3	7	0

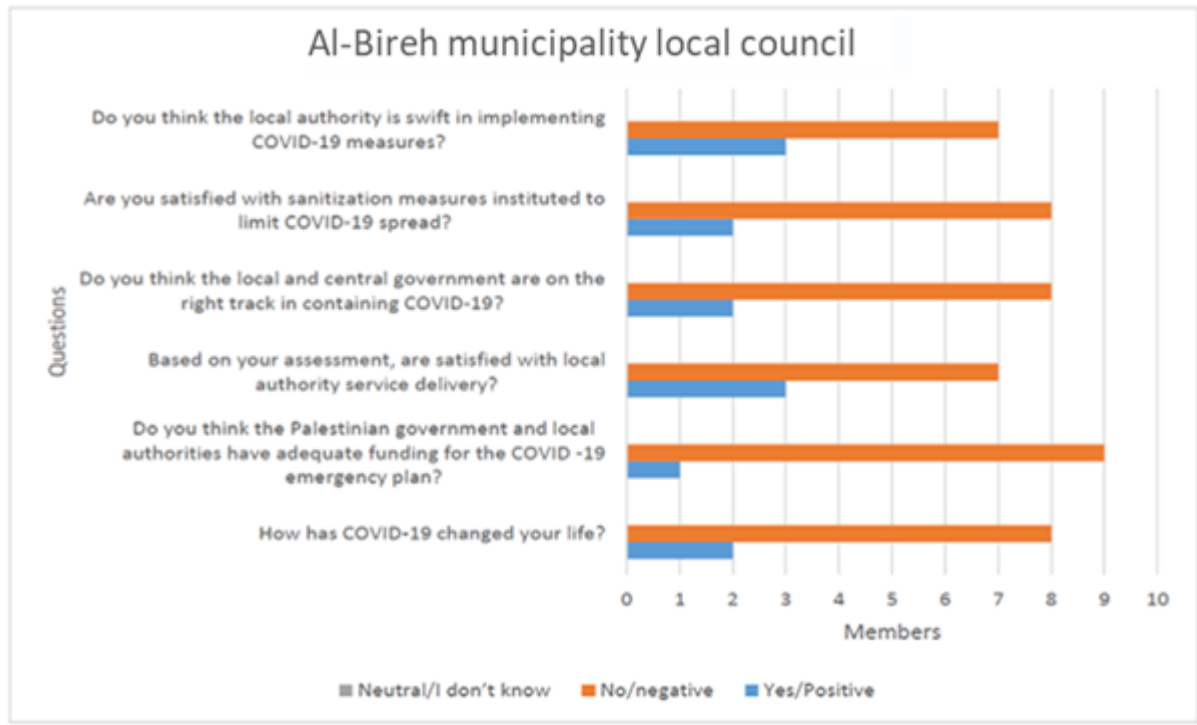


Figure 3: Al-Bireh administrators' responses chart

DISCUSSION

The tables and charts indicate how different interviewees responded to various questions on the implication of COVID-19 on local authorities. The paper results support the thesis that Palestinian local authorities face many challenges in the light of coronavirus disease. The three categories of respondents show consistency in the challenges facing Palestinian local authorities in the light of the COVID-19 pandemic. The results show that Both the administrators, local residents, and the CCOVID-19 management committee unanimously agree that the pandemic has impacted their personal lives. The impacts include among many others hindrance to accessing health services from health centres as hospitals are filled with many COVID-19 patients.

The emergency committee members' responses indicate that the local authorities have limited resources to runs the routine services amid the global COVID-19 crises. The views of the residents and the Al-Bireh municipality administrators support the committee's responses. Forty-six out of fifth residents responded that they are dissatisfied with the local authority's service delivery. The municipal administrators and the emergency committee member's responses follow the same trend. The results reflect the national trend and hence COVID-19 crisis impacts the country's social, economic, and administrative structures.

The municipal councils, as well as the emergency response committee, indicate that the national governmental government strategy is on COVID-19 is on the wrong path. The residents support the same because thirty-five pout of the fifty interviewees doubt the strategy in place. The response indicates that the country, as well as the local authorities, has many unsolved problems amid the COVID-19 pandemic. Invoking the secondary sources, many countries have supply chain challenges and the limited number of employees to address the current crises. The local authorities lack funds

to employ more health care practitioners, construct clinics, isolation, and quarantine centres. The Al-Bireh residents show that the local authorities had done little in implementing the WHO recommendation like sanitization in public facilities. Both the committee members as well as the municipal administrators show dissatisfaction with the installed public sanitization centres. The local authority has many challenges based on the responses as well as the analyzed secondary data. The municipality is facing a lack of revenue due to the Corona pandemic, not to mention the costs of transporting the waste, which led the municipalities not to take allocations as a result of the current financial situation.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

Conclusively, the local authorities in Palestine face many challenges in the current COVID-19 crises. Drawing from evidence, the main challenge is the inadequate financial capability to fund the emergent needs including construction and equipping COVID-19 diagnosis, isolation, and quarantine areas and facilities. Secondly, the emergency response strategy is biased because the various ministries have not laid out effective strategies to health the local authorities cope with the demand for resources and health amenities. The local authorities have critical challenges like waste management, poor water, and sanitization services as well as low staff deployment.

Citizens report dissatisfaction with the services offered by the local authorities due to inadequate funding to perform critical roles assigned to the local governments under the ministry of local governments. The local authorities in Palestine lack an effective emergency response strategy and therefore the ineffective struggle to manage the current pandemic emergency. Additionally, the integration between the local authorities and the government is poor and hence coordination of the response strategy is ineffective in the light of coronavirus disease.

Recommendations

The recommendations follow the identified challenges and focus on redrawing a strategy to solve the challenges affecting the Palestinian local authorities. The first recommendation is that the local authorities, under the leadership of the central government, should adopt strategic measures to counter emergencies in the future. The central government, the ministry of local governments, and the local councils should work in an integrated manner to enhance the strategy adopted works effectively. Secondly, the local authorities should strengthen public relations which makes it easier to communicate changes or strategies to the population in emergent situations. The central government should always allocate a good budget to Palestinian local authorities to improve public and social amenities like the clinics and municipal level hospitals.

The central government should also involve the local authorities in the implementation of a health strategy before rolling it out at the national level. The other recommendation is that local authorities should be allowed to borrow money as independent institutions and hence improve their financial positions and funding basic services to the citizens. It is also recommendable to allow local authorities to operate semi-autonomously and engage in activities like taxation and following tax evaders to enhance revenue collection and financial capabilities. Besides, it is recommendable to expand the power of the local governments to contribute to the planning and implementation of key strategies in Palestine.

References

1. Abd El-Aziz, T. M., & Stockand, J. D. (2020). Recent progress and challenges in drug development against COVID-19 coronavirus (SARS-CoV-2)-an update on the status. *Infection, Genetics and Evolution*, 104327
2. Ameh, G. G., Njoku, A., Inungu, J., & Younis, M. (2020). Rural America and Coronavirus Epidemic: Challenges and Solutions. *European Journal of Environment and Public Health*, 4(2), em0040.
3. Anwar, S., Nasrullah, M., & Hosen, M. J. (2020). COVID-19 and Bangladesh: Challenges and how to address them. *Frontiers in Public Health*, 8.
4. Creswell, J. W. (2014). *A concise introduction to mixed methods research*. SAGE publications.
5. Farneubun, P. K. (2020). Coronavirus (COVID-19) in Papua1 Province: An Increase in Case Numbers and the Challenges Ahead.
6. FOLLIO, P. (2020) THE COVID-19 PANDEMIC AND THE MIDDLE EAST AND NORTH AFRICA REGION..
7. Gasana, J., & Shehab, M. (2020). Coronavirus Disease (COVID 19): Handling Challenges in Kuwait. *Sci*, 2(2), 40.
8. Goel, S., Hawi, S., Goel, G., Thakur, V. K., Pearce, O., Hoskins, C., ... & Barber, A. H. (2020). Resilient and agile engineering solutions to address societal challenges such as coronavirus pandemic. *Materials Today Chemistry*, 100300.
9. Gopalan, H. S., & Misra, A. (2020). COVID-19 Pandemic and Challenges for Socio-economic Issues, Healthcare and National Programs in India. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*.
10. Imperiale, A. J., and Vanclay, F. (2020). The mechanism of disaster capitalism and the failure to build community resilience in post-disaster situations: Learning from the L' Aquila earthquake. *Disasters* <https://onlinelibrary.wiley.com/doi/abs/10.1111/disa.12431>.
11. Khan, M. G., Yezdani, U., Chakravorty, A., & Shukla, T. (2020). Efforts and Challenges paved by India to confront of Corona Virus (COVID-19). *Bangladesh Journal of Medical Science*, 88-S.
12. Khanna, R. C., & Honavar, S. G. (2020). All eyes on Coronavirus—What do we need to know as ophthalmologists. *Indian journal of ophthalmology*, 68(4), 549.
13. Lai, C. C., Shih, T. P., Ko, W. C., Tang, H. J., & Hsueh, P. R. (2020). Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease-2019 (COVID-19): the epidemic and the challenges. *International journal of antimicrobial agents*, 105924.
14. Lee, I. K., Wang, C. C., Lin, M. C., Kung, C. T., Lan, K. C., & Lee, C. T. (2020). Effective strategies to prevent coronavirus disease-2019 (COVID-19) outbreak in the hospital. *The Journal of Hospital Infection*, 105(1), 102.
15. Nicastri, E., D'Abramo, A., Faggioni, G., De Santis, R., Mariano, A., Lepore, L., ... & Corpolongo, A. (2020). Coronavirus disease (COVID-19) in a paucisymptomatic patient: epidemiological and clinical challenge in settings with limited community transmission, Italy, February 2020. *Eurosurveillance*, 25(11), 2000230.
16. Ogunleye, O. O., Basu, D., Mueller, D., Sneddon, J., Seaton, R. A., Yinka-Ogunleye, A. F., ... & Massele, A. (2020). Response to the novel coronavirus (COVID-19) pandemic across Africa: successes, challenges and implications for the future. *Frontiers in Pharmacology*.
17. Rowan, N. J., & Laffey, J. G. (2020). Challenges and solutions for addressing the critical shortage of supply chain for personal and protective equipment (PPE) arising from Coronavirus disease (COVID19) pandemic—A case study from the Republic of Ireland. *Science of The Total Environment*, 138532.
18. Singh, P. K. (2020). The research community must meet the coronavirus disease 2019 challenge. *Indian Journal of Medical Research*, 151(2), 116.
19. Venkatesh, V., Brown, S. A., & Sullivan, Y. W. (2016). Guidelines for conducting mixed-methods research: an extension and illustration. *Journal of the Association for Information Systems*, 17(7), 2.
20. Wang, Y., Wang, Y., Chen, Y., & Qin, Q. (2020). Unique epidemiological and clinical features of the emerging 2019 novel coronavirus pneumonia (COVID- 19) implicate special control measures. *Journal of medical virology*, 92(6), 568-576.

21. WHO. (2020). WHO releases guidelines to help countries maintain essential health services during the COVID-19 pandemic. Who.int. Retrieved 11 August 2020, from <https://www.who.int/news-room/detail/30-03-2020-who-releases-guidelines-to-help-countries-maintain-essential-health-services-during-the-covid-19-pandemic>.
22. Zhang, D., Ling, H., Huang, X., Li, J., Li, W., Yi, C., ... & Zhang, X. (2020). Potential spreading risks and disinfection challenges of medical wastewater by the presence of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) viral RNA in septic tanks of fangcang hospital. *Science of the Total Environment*, 140445.
23. Koozekanani, D., et al., Tracking the Optic Nerve Head in OCT Video Using Dual Eigenspaces and an Adaptive Vascular Distribution Model. *Computer Vision and Pattern Recognition, IEEE Computer Society Conference on*, 2001. 1: p. 934.