Well-Being Perception During COVID-19 Pandemic in Healthy Adolescents: Evidence From the Avatar Study

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Abstract

Background

COVID-19 pandemic provided an extraordinary and naturalistic context to observe young people's psychosocial profile and to study how a condition of environmental deprivation and lack of direct social contact, affect the well-being and health status of adolescents. The current study explored whether the COVID-19 outbreak changes, in the short term, the acute well-being perception in adolescents, as measured by a Personalised Well-being Index (PWBI) and the four components affecting health (i.e. lifestyle habits, social context, emotional status, mental skills), in a sample of early adolescent students.

Methods

Data were collected in 1019 adolescents (boys 48.3%, mean age 12.53 ± 1.25), at the beginning of school year (Baseline Condition, BC) as part of the AVATAR project and during the Italian lockdown phase (LP) using online questionnaire.

Results

During COVID-19 quarantine, adolescents showed a lower PWBI ($p = 0.000$) as compared to the baseline conditions. Considering the four health-related well-being components, lifestyle habits ($p = 0.000$), social context ($p = 0.000$), and emotional status ($p = 0.000$), showed significantly lower values during lockdown phase than baseline ones. However, mental skills, in LP, displayed a significant increase as compared to pre-COVID conditions ($p = 0.000$).

Conclusions

In this study, we have provided data on the personalised well-being index and the different components affecting health in adolescents during the COVID-19 lockdown, showing a general decreased in well-being perception, expressed in the lifestyle habits, social, and emotional components, demonstrating detrimental effects in the first phase of quarantine on adolescents'psychosocial profile. Our result shed new light on adolescence as a crucial period of risk behaviour, especially when social support is lacking.

Introduction

COVID-19 outbreak has profoundly changed lives of many people across the world. Evidence obtained during SARS, MERS, and Ebola, have documented the negative long-term effects associated to quarantine and isolation, including anxiety, depression, sleep problems, and post-traumatic stress disorders, mostly on patients and health-care workers [1, 2]. However, not much is known about the acute effects on ordinary citizen, such as children and adolescents, representing an important gap for research

[3, 4]. These, although are less likely to be infected with COVID-19, are not unresponsive to the psychosocial effects of pandemic.[5] In facts, if in adults the adverse outcomes of pandemic are mainly related to fear about being infected, job loss, and stigma [6–8], in adolescents, they are primarily due to the closure of schools and separation from friends, and sometimes, from the family, although data about pandemic effects is scarce and obtained in other home confinement conditions.[3,9] Adolescence, in normal condition, is a period of marked social changes, in which social relationships are responsible of development of self-regulating sense of identity and emotional reactivity, promoting health well-being [10]. In addition, adolescence is also a “sensitive window” of brain development and refinement, in which social environment can exercise strong impact on resilience or vulnerability [11]. In fact, on one side, adolescence is considered a time of good health when disease burden is low, on the other, during this time increased susceptibility to the onset of mental diseases [12]. Actually, the concurrent psychosocial alterations due to COVID-19 can seriously leave a negative impact on adolescents’ health, both in acute and long-term. Given that social relationship help to promote healthy behaviors, ensuring that teens are exposed to environmental enrichment, social deprivation, and thus quarantine, can, on the contrary, modify resilience, empowerment, and well-being. A Personalized Well-Being Index (PWBI) has been previously developed and already tested in healthy adolescents, on the basis of the relationship among the different weights of the variables of four well-being components, that is emotional status, lifestyle habits, social context and mental skills [13]. The current study is aimed to investigate whether the COVID-19 outbreak changes, in the short-term, the well-being perception in adolescents, as measured by PWBI in a sample of early adolescent students.

Methods

Study design and participants

The survey AVATAR COVID-19 was conducted, during the phase 1 of Italian lockdown (mid-late April 2020), using an online questionnaire. Ten junior high schools participated in the AVATAR COVID-19 study, a section of AVATAR project aimed to develop a new tool to assess lifestyle habits, social context, emotional status, and mental skills in adolescents, and to define an integrated index of the best indicators of well-being [13–15]. According to AVATAR approach, data are collected at the beginning and at the end of school year, in order to allow teachers to evaluate the effectiveness of educational strategies defined on the basis of the identified needs. During school year 2019/2020, in September/October, 3458 students aged between 10 and 14 years have been monitored, and 1019 of these completed the questionnaires during the lockdown (April 2020). Therefore, the final population consisted of 1019 adolescents with data acquired in standard conditions (at the beginning of school year) and during COVID-19 quarantine.

Adolescent students were enrolled according to the following inclusion criteria: age 10–14 years, absence of neuropsychiatric or other diseases, informed consent signed, and filling of the entire questionnaires proposed. In every school class, all the adolescents filled out the questionnaire, and, whether they were

not eligible due to exclusion criteria, they were excluded from the study retrospectively. All students filled out questionnaires in two different phases: baseline conditions (BC), at the beginning of the school year, and during lockdown phase (LP).

Participants were previously instructed on how to fill out the questionnaires and how to conduct the tests. All tests, during the first monitoring, were conducted during participants' computer lesson in school time, while during quarantine, tests were completed during distance learning in the presence of a teacher. No incentive was provided to adolescents or parents. A research assistant was available to provide information and technical support to complete questionnaires in both conditions.

The experimental protocol was approved by the internal ethics committee of each participating School, joining Rete Ulisse, in accordance with Italian law (Istituto Comprensivo - I.C.
L. Strenta Tongiorgi¸ I.C. Don Milani Viareggio, Istituto Comprensivo Pordenone Torre, Istituto Comprensivo P. A. Manciano-Capalbio, Istituto Comprensivo di Chions, Istituto Comprensivo Bagni di Lucca, Istituto Comprensivo Rorai Cappuccini, Istituto Comprensivo Niccolo' Pisano, Istituto Comprensivo Varazze-Celle "Nelson Mandela", Istituto Comprensivo Pietrasanta I). In addition, all parents or legal guardians gave informed consent, and authorized researchers to use their data in accordance with Italian law.
All procedures performed in the study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.
The AVATAR project has been accepted by the Regional Pediatric Ethics Committee (Azienda Ospedaliero Universitaria Meyer) (code 166/2018).

Data collection

Data were collected with AVATAR Web-tool [14]. A socio-demographic data record was used to collect information on gender, age, and schooling. The Italian version of KIDSCREEN-52 was used to assess health-related quality of life [16, 17]. The KIDSCREEN is a self-report questionnaire designed to address health-related quality of life, aimed to monitor and measure the personal experiences in children and adolescent about their perception of health status and well-being. The questionnaire, that describes physical, psychological, mental, social, and functional aspects of well-being, consists of 52 items grouped in 10 dimensions. KIDSCREEN questionnaires is psychometrically tested using data obtained in a multicentre European study which included a sample of 22,827 children recruited in 13 countries [18]. Dietary habits were evaluated using the Mediterranean Diet Quality Index for children and adolescents (KIDMED) [19]. The KIDMED index was based on principles sustaining Mediterranean dietary patterns as well as those that undermine it. The index ranged from 0 to 12, and consisted of a self-administered 16-question test. Physical activity levels were assessed using the Physical Activity Questionnaire for Older Children (PAQ-C). The questionnaire provides a general measure of physical activity for 8- to 20-year-olds. The PAQ-C is a self-administrated questionnaire consisting of nine items rated on a five-point scale. A higher score indicates more active children/adolescents [20]. The mental skills linked to school

engagement has been estimated through questions concerning the scholastic achievement in Language & Literature, Language acquisition, and Science [15].

Statistical analysis

Approach here defined is focused on the integration of four components of health-related well-being [lifestyle habits (LH); emotional status (ES); social context (SC); and mental skills (MS)], as perceived by adolescent [15]. The four components were obtained from the different variables analysed by the questionnaires according a Structural Model previously described in Mastorci and colleagues [15]. In addition, from the sum of the four components, we obtained a Personalised Well-Being Index (PWBI), ranging from 0 to 100, according to the AVATAR model [13]. Statistical data analyses were performed using SPSS (Version 22.0. Armonk, NY: IBM Corp). Data are presented as mean ± SD or as mean with 95% confidence interval (CI). Alpha was set at 0.05 and 2-sided p-values were reported. Changes in variables, four components, and PWBI were analyzed by Student's paired t-test, while percentage changes in the definition of the PWBI in baseline condition as compared to lockdown phase, were analyzed by Wilcoxon Ranks Test.

Results

Acute effect of COVID-19 pandemic on different psychosocial variables composing the PWBI

Descriptive data on psychosocial variables composing the PWBI in the study population, in BC and LP are presented in Table 1. Data on the KIDSCREEN-52 dimension are calculated as the mean T-scores according to KIDSCREEN Group [17].

Table 1
Score of Kidscreen-52 domains, lifestyle habits, and school performance, divided by four components of health-related well-being in study sample in Baseline Conditions (BC) and during Lockdown Phase (LP)

	VARIABLES	BC (n = 1019)	LP (n = 1019)	p-value
Lifestyle habits	Physical wellbeing	46.95 ± 6.67	43.72 ± 6.97	< 0.001
	Autonomy	47.12 ± 9.91	42.36 ± 8.61	< 0.001
	KIDMED	5.99 ± 2.6	6.46 ± 2.48	< 0.001
	PAQ-C	2.65 ± 0.69	2.65 ± 0.76	ns
	Financial resources	51.08 ± 9.32	50.59 ± 10.37	ns
Emotional status	Psychological wellbeing	50.23 ± 9.37	48.87 ± 9.83	< 0.001
	Mood/Emotion	48.62 ± 9.9	48.03 ± 9.82	< 0.05
	Self-perception	52.92 ± 10.62	52.89 ± 11.19	ns
Social context	Parent relationship	51.15 ± 9.98	50.78 ± 10.13	ns
	Peers	50.58 ± 10.12	41.49 ± 12.67	< 0.001
	School environment	49.95 ± 8.67	50.38 ± 8.71	ns
	Social acceptance (Bullysm)	50.28 ± 10.41	52.41 ± 9.33	< 0.001
Mental skills	School performance-Language & Literature	37.04 ± 3.68	33.6 ± 4.1	< 0.001
	School performance-Science	34.51 ± 4.3	37.93 ± 3.84	< 0.001
	School performance- Language acquisition	26.17 ± 3.05	23.94 ± 3.26	< 0.001
	School performance- Artistic and creativity	23.27 ± 3.47	25.54 ± 3	< 0.001

Data given as mean ± SD (95% CI). Data on the KIDSCREEN-52 dimension are calculated as the mean T-scores according to KIDSCREEN Group. ns: not significant. p-values were calculated via Student's paired t-test.

During COVID-19 quarantine, adolescents showed on average a lower perception in the psychological well-being ($p < 0.001$), physical well-being dimensions ($p < 0.001$), mood/Emotion ($p < 0.05$) as well as for autonomy ($p < 0.001$), understood as the opportunity to create his/her social and leisure time. In social context assessment, adolescent reported lower values in the relationship with peers ($p < 0.001$), but also exhibiting a higher perception of social acceptance ($p < 0.001$) during quarantine. For lifestyle, adolescents developed higher adherence to the Mediterranean diet ($p < 0.001$) as compared to baseline conditions. In mental skills component, school performance in Language & Literature ($p < 0.001$) and Language acquisition ($p < 0.001$), during lockdown phase showed lower score, while school performance perception in scientific and artistic fields revealed higher values ($p < 0.001$) than Pre COVID-19 period.

Personalised Well-Being Index and health-related well-being components

Total population analyzed in both conditions, BC and LP, was composed by 1019 students (boys 48.3%), mean age 12.53 ± 1.25. During COVID-19 quarantine, adolescents showed a lower PWBI (p = 0.000) as compared to the baseline conditions (Fig. 1).

When we considered the health-related well-being components (Table 2), lifestyle habits (p = 0.000), social context (p = 0.000), and emotional status (p = 0.000), showed significantly lower scores during quarantine than baseline values. However, mental skills, for the period of distance learning, displayed a significant increase as compared to baseline setting (p = 0.000). Considering the four areas as percentages of the total PWBI (the sum of the four areas is the index), a significant difference is observed for all components during the lockdown compared to the baseline condition (LH: p = 0.000; ES: p = 0.001; SC: p = 0.000; MS: p = 0.000, Fig. 2).

Table 2
Four components of health-related well-being in study sample in Baseline Conditions (BC) and during lockdown phase (LP)

VARIABLES	BC (n = 1019)	LP (n = 1019)	p-value
Lifestyle habits	13.75 ± 2.88	11.93 ± 3.31	< 0.001
Emotional status	19.54 ± 3.96	18.93 ± 4.94	< 0.001
Social context	21.77 ± 3.72	20.09 ± 4.89	< 0.001
Mental skills	0.3 ± 0.18	0.4 ± 0.37	< 0.001
Data presented are mean value ± SD.			

Discussion

The present study explores for the first time, to our knowledge, the short-term effects of COVID-19 quarantine on four health-related well-being components (lifestyle habits, social context, emotional status, and mental skills) and PWBI in adolescents, that is an integrated score of above mentioned dimensions. The main results can be summarized according two perspectives: 1) considering the single variables within each component; 2) analysing the four health-related well-being components forming the PWBI. Firstly, quarantine induces a lower perception in the psychological and physical well-being, in mood/Emotion, autonomy, relationship with peers, as well as the perception of bullying, while lockdown period seems to encourage healthy behaviors in terms of higher adherence to the Mediterranean Diet and creativity. Secondly, according an integrated approach between the variables and the components, the key findings can be reassumed in the following points: i) during lockdown phase, adolescents showed a lower well-being perception as shown by the decreased PWBI; ii) the four areas, composing PWBI,

although maintaining the same order of importance, they changed significantly in percentage terms, increasing during quarantine the contribute to the emotional status; iii) lifestyle habits, social context, and emotional status, in absolute values, decreased during quarantine as compared to baseline conditions, whereas mental skills enhanced during COVID-19 outbreak.

The circumstances related to the COVID-19 pandemic provided an extraordinary and naturalistic context to observe young people's psychosocial profile, and to study how a condition of environmental deprivation and lack of direct social contact, affect adolescent's well-being. Before COVID-19, the evidence on the effects of isolation came primarily from animal models [21–23]. Human studies were mainly focused on adults, while there are very few comparable studies on adolescents regarding their quarantine experiences [7, 8]. In adolescents, on the other hand, studies have predominantly pointed out that the nature, quality, and complexity of social connections, and not social deprivation, as positively correlated with grey matter volume of the amygdala, medial pre-frontal cortex, and superior temporal sulcus (STS), that are part of the affective and mentalizing systems [24]. On the contrary, a lack of social connection, such as quarantine, can have detrimental effects on the brain. In fact, neuroimaging evidences shown that individuals who report a lack of social relations had a reduced volume of gray matter on the STS and display problems in processing social input [25]. The study of Sprang et al. assessed the impact of different (H1N1 influenza A, SARS, avian influenza) pandemic occurred in six USA states, Mexico and Canada. The study evaluated the psychological impact of quarantine in terms of incidence of post-traumatic stress disorder, that was in one-third of the children experiencing isolation or quarantine [26]. Saurabh and coworkers studied 121 Indian children quarantined during Covid-19 outbreak and showed that these subjects experienced greater psychological distress, worry, helplessness, and fear in comparison to no-quarantined ones [27]. In another study, Pisano et al. focused on the emotional and behavioral impact of COVID-19 quarantine in children aged between 2–10 years through administering their parents appropriate questionnaires. They found that children have had manifestation of regressive behavior and of opposite behavior, although they also showed manifestations of adaptation, calmness, balance, adaptation to restriction [28].

In comparison to the above-mentioned studies, we enrolled healthy adolescents aged between 10 to 14 years, who fulfilled themselves questionnaires, the first one at school and the second one at home during confinement. Moreover, we administered questionnaires assessing self-perception of well-being without any kind of clinical implication. This means that we maintained our evaluation in a preclinical condition, assessing the difficulties and the issues raised up with quarantine, potentially leading, in the long-term, to post-traumatic stress disorder or other clinical problems. Further, we assessed well-being by means of an integrated and personalized index, PWBI, already published in other studies, based on the relationship among the different statistical weights of the variables belonging to the four dimensions: lifestyle habits, emotional status, social context and mental skills [13, 29]. In the present study, the four PWBI components were also individually assessed in order to ascertain their changes during COVID-19 quarantine. Thanks to this index it is possible to identify, under stressful conditions such as quarantine, the strength and the fragile characteristics of each adolescent to potentiate the first ones and to change or improve the others through the application of personalised educational programs. In this regard, PWBI

intervenes at multiple levels in the promotion process of health and well-being in the young in the different psychosocial settings, combining management and empowerment in terms of ability to monitor well-being status and applying prevention strategies to reduce disease burden both in the short-, medium, and long-term.[13]

The results showed that PWBI significantly fell during COVID-19 quarantine and its breakdown corresponded to a lower score in three over four components that are lifestyle, social context and emotional status. The basal data confirmed the results of our previous work, which highlighted the preponderant role of the social context and the lack of involvement of the mental skills in the perception of well-being [13].

Our data seem to confirm what has recently been hypothesized from Italy, Spain and China studies that suggests significant emotional and behavioral changes during COVID-19 quarantine in adolescents [28, 30]. In fact, emotional status of our sample, during isolation, in terms of self-perception and psychological well-being, compared to the baseline values, was significantly reduced in absolute values. However, when we considered the percentage in which the four areas made up the PWBI, during the quarantine, emotional dimension increased to indicate that in these conditions, the psychological state, although reduced in absolute values, acquired more importance. In other words, if in basal conditions the perception of well-being was much more linked to the social context, during quarantine, an increase in the psychological component is overlapped to a reduction in the role of the social context.

Interestingly, during the closing period of schools and distance learning we have observed an improvement in the cognitive skills as compared to baseline condition. This increase in mental abilities could be explained by the fact that adolescents usually live under such intense stress conditions until they develop burnout, possibly related to school, routine, friendships and other responsibilities [31]. Indeed, this data could be in line with previous studies showing that difficulty situations, sometimes, through resilience mechanisms and empowerment, can have positive effects on cognitive aspect and in general on health status [32, 33]. Data obtained during natural disaster, for example, have shown that resilience depends on adequate communication and preparedness, good social support and capacity to adapt and cope with traumatic events [33].

In addition, in terms of lifestyle, our results are in agreement with the notion that assert that staying at home, with limitation of outdoors and in-gym physical activity, compromises the perception of heaving healthy habits. In our case, overall behaviors linked to lifestyle habits, such as spare time, the perception of health and economic well-being, and not only diet and physical activity are reduced [15]. However, a recent Italian study, aimed to explore the impact of the COVID-19 pandemic on eating habits and lifestyle changes among the Italian adolescents, demonstrated an improvement of lifestyle, with a reduction on tobacco consumption and a higher adherence to the Mediterranean diet [34].

The main limitation of the present study is represented by a self-reported questionnaire and the different place of monitoring. In fact, in baseline, the questionnaires were completed during a school class, and it

is possible that the school classroom environment may have biased the students' responses, especially for items related to the school class environment; while during quarantine, although questionnaires were completed during distance learning in the presence of a teacher, they were conducted in the housing context. However, our web survey was the same one used in other protocols by our group [13, 15, 29]. A strength of our study was represented by the fact that the survey was conducted quickly in the most critical period of the pandemic in Italy, after one month from the start of the lockdown.

Conclusion

In this study we have showed a general decreased in well-being perception in the acute phase of COVID-19 lockown. Quarantined adolescents are at high risk for developing higher risk for psychological health-related challenges, probably both in acute and in chronic period. These findings suggest the need to integrate psychosocial health care into the planning and implementation of preventive strategies for quarantine measures. In particular, schools and health institutions should implement guidelines for the psychosocial support of adolescents already in the early stages of the health emergency, in order to avoid the long-term impact of such stress on mental health. It is pivotal that educational institution, health authorities, and parents work together to reduce in adolescents emotional distress, fear, and anxiety through communication and facilitate professional counseling to address stressors and its possible countermeasures. Therefore, as the COVID-19 pandemic is still ongoing, future longitudinal studies to explore the relationship between psychological dimension and social context and the effects of school closure and other social distancing practices in adolescence, are urgently needed to shed light on the pathways to resilience or vulnerability mechanisms for the development of psychopathology in the short and in the long-term.

Declarations

Ethics approval and consent to participate

This study was approved by the internal ethics committee of each participating School, in accordance with Italian law (Istituto Comprensivo - I.C. L. Strenta Tongiorgi¸ I.C. Don Milani Viareggio, Istituto Comprensivo Pordenone Torre, Istituto Comprensivo P. A. Manciano-Capalbio, Istituto Comprensivo di Chions, Istituto Comprensivo Bagni di Lucca, Istituto Comprensivo Rorai Cappuccini, Istituto Comprensivo Niccolo' Pisano, Istituto Comprensivo Varazze-Celle "Nelson Mandela", Istituto Comprensivo Pietrasanta I). In addition, all parents or legal guardians gave informed consent, and authorized researchers to use their data in accordance with Italian law. All procedures performed in the study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The AVATAR project by Clinical Physiology Institute, CNR, has been accepted by the Regional Pediatric Ethics Committee (Azienda Ospedaliero Universitaria Meyer) (code 166/2018).

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request

Competing interests

The authors have no competing interests as defined by BMC, or other interests that might be perceived to influence the results and/or discussion reported in this paper.

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Authors' contributions

FM, MP, CV, AP designed the study; FM, LB, GT, CD, AC, IM, prepared the process evaluation framework; FM, LB, CD, AP analysed the data. All authors critically reviewed the manuscript, contributed to interpretation and approved the submitted version. The author (s) read and approved the final manuscript.

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Authors' information (optional)

No other information

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Figures

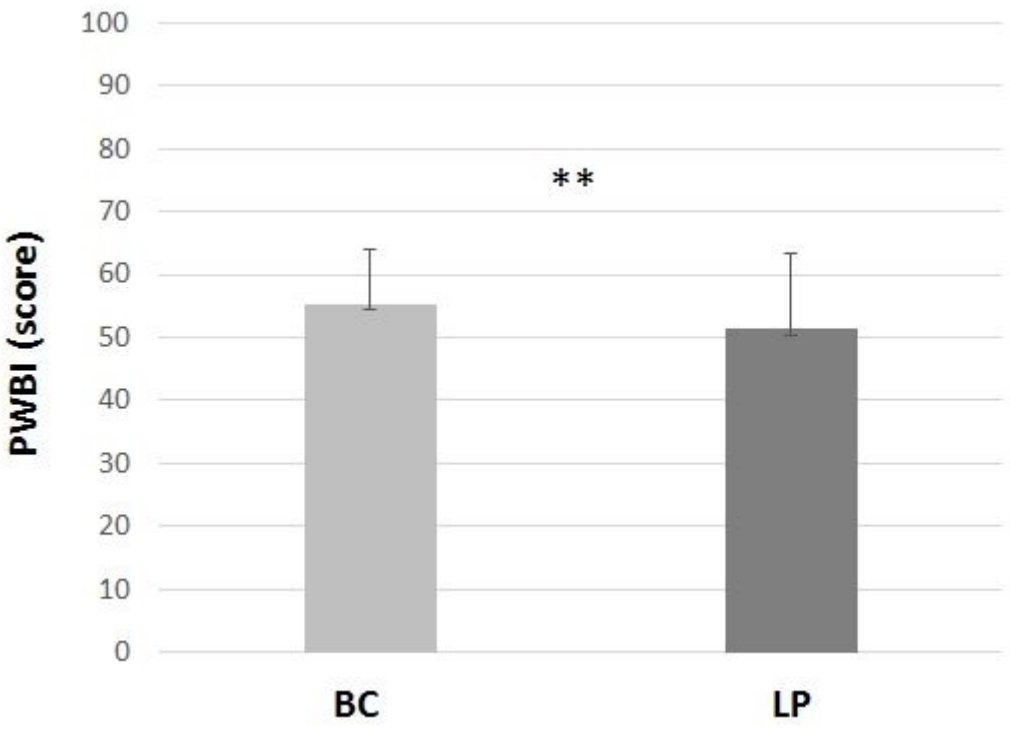

Figure 1

Personalised Well-Being Index (PWBI) in baseline conditions (BC) and in lockdown phase (LP) in overall population.

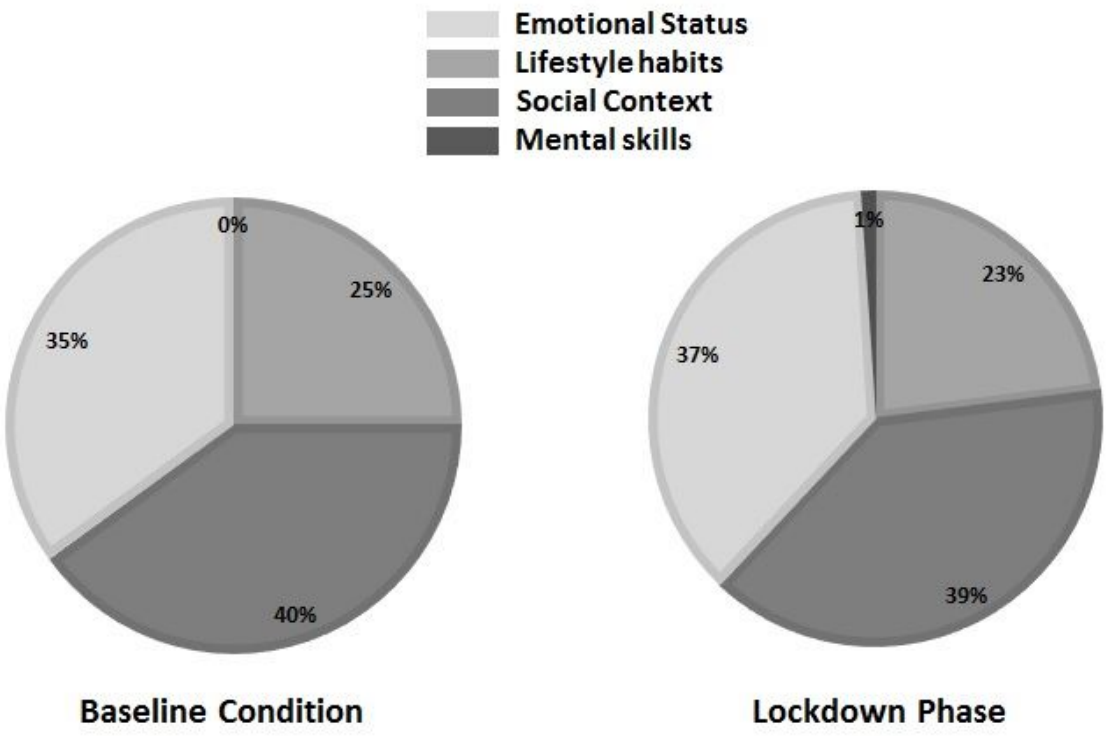

Figure 2

Percentage composition of Personalised Well-Being Index in baseline conditions (BC) and in lockdown phase (LP) in overall population.