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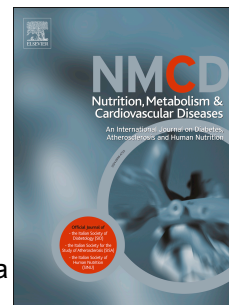
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1 **“Quarantine during COVID-19 outbreak: changes in Diet and physical activity**
2 **increase the risk of cardiovascular disease”.**

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50 **Abstract**

51

52 Aims. CoV-19/SARS-CoV-2 is a highly pathogenic virus that is causing a global pandemic
53 with a high number of deaths and infected people. To contain the diffusion of infection,
54 several Governments have enforced restrictions on outdoor activities or even collective
55 quarantine on the population. The present commentary briefly analyzes the effects of
56 quarantine on lifestyle, including nutrition and physical activity and the impact of new
57 technologies in dealing with this situation.

58 Data Synthesis. Quarantine is associated with stress and depression leading to unhealthy
59 diet and reduced physical activity. A diet poor in fruit and vegetables is frequent during
60 isolation, with a consequent low intake of antioxidants and vitamins. However, vitamins
61 have recently been identified as a principal weapon in the fight against the Cov-19 virus.
62 Some reports suggest that Vitamin D could exert a protective effect on such infection.
63 During quarantine, strategies to further increase home-based physical activity and to
64 encourage adherence to a healthy diet should be implemented. The WHO has just released
65 guidance for people in self-quarantine, those without any symptoms or diagnosis of acute
66 respiratory illness, which provides practical advice on how to stay active and reduce
67 sedentary behaviour while at home.

68 Conclusions. Quarantine carries some long-term effects on cardiovascular disease, mainly
69 related to unhealthy lifestyle and anxiety. Following quarantine, a global action supporting
70 healthy Diet and physical activity is mandatory to encourage people to return to a good
71 lifestyle routine.

72

73 Key-words: quarantine; COVID-19; stress; lifestyle; gender; physical activity; vitamin D

74

75

76 The emergence of novel coronavirus, officially known as Severe Acute Respiratory
77 Syndrome-Coronavirus-2 (SARS-CoV-2), has presented an important challenge for
78 healthcare systems across the world. Rapid transmission is due to high infectivity, capacity
79 to be transmitted even during asymptomatic phase and relatively low virulence. [1]
80 On March 12, 2020 the WHO defined the COVID-19 infection as pandemic. [2]
81 Quarantine and isolation are two measures that can prevent, or minimize, the impact of
82 infectious disease outbreaks. In public health practice, “quarantine” refers to the
83 separation of persons (or communities) who have been exposed to an infectious disease.
84 “Isolation,” in contrast, applies to the separation of persons who are known to be infected.
85 [3]
86 The word quarantine comes from the Italian quarantena, meaning "forty days", used in the
87 14th-15th-century Venetian language and designating the period that all ships were
88 required to be isolated before passengers and crew could go ashore during the Black Death
89 plague epidemic [4].
90 In the Modern Era there are several examples of Government imposed quarantine or travel
91 bans. i.e. at least 18 U.S. states quarantined people returning from West Africa during the
92 2014 Ebola outbreak. [3] Recently, the Italian Government among others has enforced
93 quarantine on the population to contain the diffusion of the COVID-19 virus. The previous
94 experience of the SARS outbreak showed the efficacy of timely quarantine and isolation
95 measures. [5,6] Singapore and Hong Kong, both of which had severe acute respiratory
96 syndrome (SARS) epidemics in 2002–03, provide hope and many lessons to other
97 countries. Today, quarantine and social distancing reduced transmission of COVID-19
98 infection by about 60% in China [7]. However, a further peak will likely occur when
99 restrictive measures to avoid major economic impact are relaxed. [7] Nevertheless,
100 quarantine is an unpleasant experience: with loss of freedom, uncertainty over disease
101 status, and boredom it can affect the health status of subjects. Therefore, the potential

102 benefits of mandatory mass quarantine need to be weighed carefully against the possible
103 long-term negative effects on health, i.e. cardiovascular risk burden, and mental disease.
104 [8,9]

105 Quarantine induces anxiety and stress. Western health care systems have been built
106 around the concept of patient-centered care, but such a pandemic requires a change of
107 perspective toward a concept of community-centered care.[10] This increases anxiety in
108 people who have concerns about their own health. Survey studies on subjects who had
109 been quarantined reported a high prevalence of psychological distress and disorder
110 symptoms. These included emotional disturbance, depression, stress, low mood,
111 irritability, insomnia, post-traumatic stress [11-14].

112 During outbreaks of infection people are likely to experience fear of falling sick or dying
113 themselves, feelings of helplessness, and stigma [13-14]. During one influenza outbreak,
114 around 10% to 30% of the general public were very or fairly worried about the possibility of
115 contracting the virus. With the closure of schools and business, negative emotions
116 experienced by individuals increased. [15-16]

117 The present commentary briefly analyzes the effects of quarantine on lifestyle, including
118 nutrition and physical activity and the impact of new technologies in dealing with this
119 situation.

120

121 **Effects of stress and anxiety on lifestyle during quarantine**

122 Sudden catastrophic events i.e. earthquake are associated with an increase in sudden
123 cardiac deaths, and an overall increase in death from atherosclerotic and ischemic heart
124 disease. [17]

125 The reasons for this increase in cardiac events after catastrophic events include an acute
126 increase in sympathetic nervous activity and catecholamines.

127 In the case of quarantine people suffered from a chronic increase of sympathetic nervous
128 activity leading to a chronic negative effect on heart and vessels. Social isolation and
129 loneliness are associated with a very high risk of mortality and the development of major
130 chronic disease. [18] Specifically, social isolation is associated with an increased risk of
131 mortality in patients with CVD. [19]

132 The acute stress response of an integrated cascade of physiological reactions has been well
133 described [20,21] On the contrary, less is known about how chronic stress responses
134 convert to pathological changes over time, contributing to the development and
135 progression of cardiovascular disease. [21]

136 The great majority of data come from studies evaluating personal stress (i.e. the death of a
137 close person) or categories of persons (i.e. workers during major economic recession).

138 Little is known about outcome after a period of quarantine and outbreaks, even though all
139 agree this corresponds to a period of high stress. Stress-related changes in the
140 sympathetic–parasympathetic balance and the neuroendocrine dysregulation involving the
141 hypothalamus–pituitary– adrenal responses might adversely affect the cardiovascular
142 system both by accelerating the atherosclerotic process and by precipitating the occurrence
143 of a cardiovascular event. Repeated or chronic exposure to stress facilitates the progression
144 of atherosclerosis. Adrenaline and noradrenaline increase the heart rate and decrease
145 heart rate variability, optimize blood flow to muscle tissues, and elevate core body
146 temperature. The sympathetic nervous system has direct cardiostimulatory effects
147 (chronotropy and inotropy via β_1 -adrenergic receptors) and pressor effects (via
148 α_1 -adrenergic receptors) and also affects metabolism (promotes insulin resistance and
149 lipolysis) and the immune system [22,23,24]

150 Moreover, unhealthy behaviors and economic crisis contribute to increased health risk,
151 with socially isolated and lonely individuals having less favorable lifestyles. [25,26]

152 An analysis of UK Biobank indicated that health behavior accounted for more than 30% of
153 the excess risk of mortality attributed to social isolation and loneliness over a 6.5 year
154 follow-up period [27]

155 The main consequence of stress related to quarantine is a change in lifestyle and
156 nutritional habits. (Table 1) Changes in nutritional habits can be due to: 1. reduced
157 availability of goods, 2. limited access to food caused by restricted store opening hours, 3.
158 switch to unhealthy food.

159 Analysis performed following the Ebola outbreak quarantine showed that having
160 inadequate food and water supplies was a source of frustration and emotional stress. The
161 WHO and Liberia's Ministry of Health found that during the outbreak many families in
162 quarantine did not receive food supplies. In some cases even access to water and sanitation
163 facilities could not be guaranteed for people in quarantine. These conditions do not seem
164 compatible with quarantine or isolation being forms of "easy rescue". In addition, Ebola-
165 exposed families who were subject to quarantine measures in West Africa during the 2014-
166 15 outbreak suffered significantly from stigmatization and loss of livelihoods, as well as
167 possible increased exposure. [6,28,29]

168 Due to anxiety surrounding future food shortage, people purchase packaged and long-life
169 food rather than fresh food. Foods with long shelf-life shorten the life line owing to their
170 salt, sugar or trans-fat content. [30]

171 This leads to an unhealthy diet poor in antioxidants food i.e. fresh fruit and vegetables that
172 would increase oxidative stress and inflammation. [31,33]

173 The modern diet era began with the primate evolution when primate biology lost its ability
174 to synthesize vitamin C consequent to a healthy consumption of fruits [33]

175 Over the last 150 years, refining, hydrogenation, salting and frying were adopted as
176 methods of prolonging the shelf life of food substances. Refined sugar with added fat
177 increased the energy density of the food materials by 6 times. [34]. These dietary changes

178 generated a major mismatch between the genetic structure of man and what he could
179 metabolize [35]. Over the last 40 years dietary guidelines and population strategies
180 together with good public education and simultaneous efforts directed at other lifestyle
181 issues, such as promoting healthy Diet (i.e. the Mediterranean Diet or Dash Diet),
182 improving physical activity and reducing tobacco consumption, have notably reduced
183 cardiovascular mortality. [32,35-37]

184 During quarantine our diet takes a step back from being a healthy diet rich in fresh food to
185 one containing foods with a long shelf-life.

186 In addition, for many people, the typical response to chronic stressful situations is not to
187 avoid food but possibly to seek out and consume energy-dense foods [38-41].

188 Anxiety, depression, uneasiness, and anger are emotions that commonly accompany
189 chronic stress [42]. The responses to acute or chronic stress also include a number of
190 modifying behaviors such as alcohol consumption, smoking, and eating. [40,42]

191 When individuals respond to stress by eating more, anecdotal evidence suggests the foods
192 selected are typically high in sugar and fat. [42] This desire to consume a specific kind of
193 food is defined as “food craving”. Food craving is a multidimensional experience as it
194 includes cognitive (e.g., thinking about food), emotional (e.g., desire to eat or changes in
195 mood), behavioral (e.g., seeking and consuming food), and physiological (e.g., salivation)
196 aspect [43, 44]

197 The craving for carbohydrates encourages the production of serotonin which has a positive
198 effect on mood. This effect on mood is proportional to glycemic index of foods. [43]

199 Muscogiuri and colleagues recently pointed out that quarantine-related stress translates
200 into sleep disturbances that further worsen stress and increase food craving. [43]

201 They reported on importance of consuming foods containing or promoting the synthesis of
202 serotonin and melatonin at dinner. (e.g. roots, leaves, fruits and seeds such as almonds,

203 bananas, cherries and oats) In addition, milk and dairy products are the main sources of
204 sleep-inducing tryptophan amino acid, a precursor of serotonin and melatonin.
205 Tryptophan is involved in the regulation of satiety and calorie intake via serotonin which
206 mainly reduces carbohydrate and fat intake and inhibits neuropeptide Y. [43] Dairy
207 products such as yogurt could also increase the activity of natural killer cells and reduce
208 the risk of respiratory infections suggesting a potential function protection against SARS-
209 CoV-2 disease. This unhealthy nutritional habit may contribute to excess energy intakes
210 and weight gain, increasing the risk of developing obesity. [45,46] Obesity is associated
211 with chronic inflammation, and it is a strong risk factor of heart disease, diabetes, and lung
212 disease that have been demonstrated to increase the risk for more serious complications of
213 CoVID-19 [47]

214
215 Torres and coworkers identified that people cope with stress by eating and drinking in an
216 attempt to feel better (“stress-related eating”). These stress-driven eaters and drinkers
217 were more likely to consume unhealthy foods such as snacks, hamburgers, soda cola, and
218 chocolate regularly and to drink wine and spirits more frequently. In addition the lack of
219 emotional support from friends and relatives was predictive of stress driven eating and
220 drinking behaviors [42,48]. During quarantine, stress-driven eaters would easily switch
221 from a healthy diet to an unhealthy one. In addition, the increase in macronutrient intake
222 could also be accompanied by micronutrient deficiency. During quarantine the Diet is poor
223 in fresh fruit and vegetables. Fruits and vegetables are rich in micronutrients and
224 antioxidants. [49] Micronutrients include vitamins that act as antioxidants by reducing the
225 inflammatory response and improving the immune response. Anti-oxidants increase the
226 number of T-cell subsets, enhance lymphocyte response to mitogen, increased interleukin-
227 2 production, and potentiated natural killer cell activity. This would affect cardiovascular
228 risk mainly in high-risk patients. Therefore, during this period it is essential to follow a

229 balanced nutritional diet that includes a high amount of antioxidants and vitamins. In
230 some cases it may be helpful to take vitamin and minerals supplements. However, despite
231 epidemiologic studies have reported that high dietary intake of foods rich in vitamin E,
232 vitamin C, and β - carotene, have been inversely associated with the incidence of CAD,
233 different results are obtained with vitamin and antioxidant supplementations. [50]
234 Several reasons have been proposed to explain this lack of results obtained with
235 antioxidants supplements: define the optimal dosage, use the appropriate vitamin isomer,
236 interference or competition between vitamins, inter-individual variation to response to
237 vitamin. [50]
238 The very recent literature focused on the potential beneficial effect of Vit. D
239 supplementation on patients with COVID-19.

240 **Vitamin D and COVID-19**

241 From recent journal literature, it is known that COVID-19 infection is associated with the
242 increased production of pro-inflammatory cytokines, and C-reactive protein [51,52].
243 Antioxidants and vitamins exert protective effects against infection and inflammation.
244 Some research suggested the efficacy of vitamin supplements to prevent COVID 19
245 infections. A letter from Panarese and coworkers suggested that vitamin D deficiency may
246 also contribute to airway/gastrointestinal infectious illnesses. [53] Vitamin D has immune-
247 modulatory properties, that include down-regulation of pro-inflammatory cytokines. [54-
248 56] It is possible that the protective effect of vitamin D against COVID-19 is related to
249 suppression of cytokine response and reduced severity/risk for ARDS. In addition, a meta-
250 analysis shows that regular oral vitamin D₂/D₃ intake (in doses up to 2000 IU/d without
251 additional bolus), is safe and protective against acute respiratory tract infection, especially
252 in subjects with vitamin D deficiency. [56] The elderly display a very high prevalence of
253 hypovitaminosis D, especially during the winter. [53] It therefore seems plausible that

254 Vitamin D prophylaxis may contribute to reducing the severity of illness caused by SARS-
255 CoV-2, particularly in settings where hypovitaminosis D is frequent, including people
256 currently living in Northern countries. [54] Regardless of age, ethnicity, and latitude;
257 recent data showed that 40% of the Europeans are vitamin D deficient (25(OH)D levels
258 <50 nmol/L), and 13% are severely deficient (25(OH)D <30 nmol/L). It is known that
259 severe vitamin D deficiency dramatically increases the risk of mortality, infections, and
260 many other diseases. [57]

261 In a retrospective multicentre study of 212 cases with laboratory-confirmed infection of
262 SARS-CoV-2, an increase in serum 25(OH)D level in the body could either improve clinical
263 outcomes or mitigate worst (severe to critical) outcomes, while a decrease in serum
264 25(OH)D level in the body could worsen clinical outcomes of COVID-2019 patients.
265 [58]

266 In this patient's population, those with 25OHD >75 nmol/l had lower symptoms than
267 those with lower 25OHD.

268 A recent review suggested using vitamin D loading doses of 200,000–300,000 IU in
269 50,000-IU capsules to reduce the risk and severity of COVID-19. Grant and coworkers
270 suggested that higher vitamin D doses and 25OHD concentrations would be better for
271 prevention and probably, reduce the risk of influenza and COVID-19 incidence and death.
272 [59] Several reviews consider the ways in which vitamin D reduces the risk of viral
273 infections. [56,59,60] Vitamin D has many mechanisms by which it reduces the risk of
274 microbial infection and death. Vitamin D helps maintain tight junctions, gap junctions,
275 and adherens junctions (e.g., by E-cadherin) fighting against the action of viruses to
276 disturb junction integrity, increasing infection by the virus and other microorganisms. [61]

277 Vitamin D also enhances cellular immunity by reducing the cytokine storm induced by the
278 innate immune system. The latter generates both pro-inflammatory and anti-inflammatory
279 cytokines in response to viral and bacterial infections, as observed in COVID-19 patients.

280 [51] Vitamin D can reduce the production of pro-inflammatory Th1 cytokines, such as
281 tumor necrosis factor α and interferon γ . [62] Food rich in vitamin D are: salmon, sardines,
282 cod liver oil, canned tuna, egg yolks, mushrooms, and meat. [63] Fish are poor represented
283 in the diet typically consumed by the elderly people living in the North of Italy, leading to a
284 reduced intake of Vitamin D. Magnesium supplementation is recommended when taking
285 vitamin D supplements. Magnesium helps activate vitamin D, which in turn helps regulate
286 calcium and phosphate homeostasis to influence the growth and maintenance of bones. All
287 the enzymes that metabolize vitamin D seem to require magnesium, which acts as a
288 cofactor in the enzymatic reactions in the liver and kidneys. [64]

289 Practical tips to avoid vitamin D deficiency during quarantine are: taking short walks,
290 increasing sun exposure; consume foods rich in vitamin D; and/or drug supplementation

291 Preliminary observations support the hypothesis that vitamin D supplementation can
292 reduce the risk of influenza and COVID-19. However, the incidence and death should be
293 investigated in trials to determine the appropriate doses, serum 25(OH)D concentrations,

294 **Effects of stress and anxiety on physical activity**

295 The “GLOBAL ACTION PLAN ON PHYSICAL ACTIVITY 2018-2030” published by WHO
296 indicated physical activity as mandatory for prevention of non-communicable disease. [65]

297 Regular physical activity is associated with reduction in cardiovascular risk. [65-67]

298 The “2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease”
299 recommended that “Adults should engage in at least 150 minutes per week of accumulated
300 moderate-intensity or 75 minutes per week of vigorous-intensity aerobic physical activity
301 (or an equivalent combination of moderate and vigorous activity) to reduce ASCVD risk”
302 (Class I LOE B-NR) or “for adults unable to meet the minimum physical activity
303 recommendations, engaging in some moderate- or vigorous-intensity physical activity,

304 even if less than this recommended amount, can be beneficial to reduce ASCVD risk”
305 (Class IIa LOE B-NR).[68] Prolonged TV viewing time is associated with an increased risk
306 of type 2 diabetes mellitus, CVD, and all-cause mortality [68]. Prolonged sedentary time is
307 independently associated with deleterious health outcomes, regardless of levels of physical
308 activity [67,68] During quarantine Governments prohibited the great majority of outdoor
309 exercise and social activities (e.g. going to the gym) resulting in a reduction of physical
310 activity. Inflammation is an underlying pathophysiological process in chronic diseases,
311 such as obesity, T2 diabetes, and cardiovascular disease. Regular physical activity reduces
312 inflammation, and oxidative stress and helps to maintain normal weight and to reduce
313 visceral fat accumulation. [65,66] Limited physical activity and inability to take a regular
314 walk out of one’s home as a consequence of collective quarantine, may be associated with
315 several metabolic effects that would increase the cardiovascular risk. It is also established
316 that many beneficial metabolic and cardiovascular adjustment in response to physical
317 exercise can be lost in just two weeks of inactivity, impairing aerobic capacity and/or
318 increasing blood pressure. Sudden exercise cessation has been associated with rapid onset
319 of insulin resistance in muscle tissue and decreased muscle glucose utilization that
320 worsened muscle performance. [69]

321 During quarantine, staying active and maintaining a physical exercise routine will be
322 essential for mental and physical health. [70,71,72] The WHO has just released guidance
323 intended for people in self-quarantine without any symptoms or diagnosis of acute
324 respiratory illness, containing practical advice on how to stay active and reduce sedentary
325 behavior while at home. They suggest following on-line exercise classes, and using video-
326 or app-guided aerobics training at home. Table 2 summarizes the WHO indication “Stay
327 physically active during self-quarantine”. [73] Little is known about the effects of home-
328 based physical activity on chronic disease. [67,74,75] The Web could prove useful, since
329 today there are many workout videos available that can assist people in exercising on their

330 own. However, trying to execute all steps (body pose alignments) in a workout accurately,
331 in order to avoid long-term muscle and joint injuries is risk related. [74,75]

332 In addition, almost all modern Smartphone provide step-count and application for
333 nutrition. Today, it is estimated that more than 5 billion people have mobile devices, and
334 over half of these connections are smartphones. Therefore, there are higher potential apps
335 to be developed for lifestyle behavior change in the community. Many people to control
336 their diet and maintain their personal ideal weight use mobile applications related to
337 nutrition. The increasing number of health and nutrition applications available on Google
338 Play and the Apple App Store proves the awareness of community regarding adopting a
339 healthy lifestyle. App programs may be more effective when social support is advocated
340 and could be a useful instrument in order to reduce the negative impact of quarantine on
341 lifestyle. [76,77]

342 Telemedicine is an important tool for patient home monitoring and is very useful for
343 nutritional, motor, psychiatric and psychological support in quarantined patients.

344 **Sex differences.**

345 Sex differences are present in several diseases. Preliminary data suggest that SARS-CO-2
346 affected more men than women. One reason seems to be that men have higher rates of
347 chronic disease, a risk factor for COVID-19. However, women are less physically active
348 than men. Severe COVID-19 patients had significantly higher levels of Th1 cytokines (IL-6
349 and TNF- α) and higher incidence rate of ARDS, compared with non-severe cases,
350 suggesting a more intense inflammatory response. [78] It is known that after ischemic
351 damage, male gender has a significantly higher level of IL-6. [79] Similarly, exercise-
352 induced muscle damage triggers inflammatory responses that result in elevations of
353 inflammation markers such as C-reactive protein (CRP) and some inflammatory

354 interleukins (IL-1, IL-6, tumor necrosis factor (TNF- α)). [80] On contrary, regular physical
355 activity seems to reduce IL-6 and C-reactive protein. Usually women are less physically
356 active than men and the gap increase after menopause [66]. During and after menopause,
357 most women tend to reduce their physical activity levels and together with the reduction in
358 basal metabolic rate, these lead to a loss of skeletal muscle mass as well as loss of bone
359 mineral density. [66,81] During perimenopause period, fat deposition shifts to favor the
360 visceral depot that, in addition to the decreased protective effect of estrogen, contributes to
361 endothelial dysfunction, inflammation, altered fatty acid metabolism, insulin resistance,
362 all markers of CVDs. [66,67]. There is a direct relationship between time spent sitting,
363 physical activity and the CVD risk in postmenopausal women, independent of leisure-time
364 physical activity. Prolonged sitting time determines many detrimental adaptations, such as
365 increased energy intake and reduction of skeletal muscle lipoprotein lipase activity that
366 might explain its effect on cardiovascular risk factors [66] In addition, the described food
367 craving has a higher prevalence in women than in men. [43,44]

368 Quarantine induced a reduction of physical activity and an increase in the sitting time
369 leading to an increase of cardiovascular risk in women. It is mandatory to promote a call of
370 action for women mostly after 40 years, for a healthy life style during quarantine to reduce,
371 as consequence, cardiovascular risks.

372

373 **Impact of quarantine on people with obesity**

374 During the quarantine, patients suffering from obesity experienced immense stress which
375 made them more vulnerable to over-eating and sedentary lifestyle, thus predisposing them
376 to further weight gain. Moreover, the incoming economic downturn will also lead to more
377 consumption of unhealthy foods as it is cheaper. This will lead to further increase in
378 obesity prevalence especially in weaker sections of the society.[Recently, growing scientific
379 evidence has reported an important role of obesity in Covid-19's prognosis [82]

380 Obesity is a leading risk factor of cardiovascular disease, diabetes, renal disease, and has a
381 detrimental effect on lung function. A pro-inflammatory state coupled with malnutrition
382 may lead to impaired immune response in patients suffering from obesity and increased
383 susceptibility to all influenza viruses including COVID-19 [83,84] Obesity has some
384 detrimental effects on immune system that include alterations in leukocyte development,
385 phenotypes and activity. In particular, obesity has been shown to impair memory CD8+ T
386 cell responses to influenza virus infection, resulting in increased mortality, viral titers in
387 lung, and worsened lung pathology. [82] Two possible mechanisms have been
388 hypothesized to explain the relationship between obesity and more serious disease in
389 patients with Covid-19: lung function disorders and endothelial dysfunction. Both
390 mechanisms have a common pathway: the increase in pro-inflammatory cytokines and the
391 "cytokine storm". SARS-Cov-2 binds the trans-membrane angiotensin converting enzyme-
392 II receptor inducing an acute endothelial injury. The storm of pro-inflammatory cytokines
393 increases the expression of adhesion molecules which promotes endothelial activation and
394 cascade activation of coagulation, leading to a worsening of the microcirculation system
395 and tissue perfusion.[85] The "cytokine storm" can lead to acute respiratory distress
396 syndrome or even multiple organ failure. It represents a phenomenon of immune hyper
397 activation very similar to Cytokine-release syndrome (CRS).

398 Subjects presented with obesity have a pro-inflammatory status and the exposure to
399 COVID-19 could further exacerbate inflammation exposing them to higher levels of
400 circulating inflammatory molecules [82]

401 Obese subjects must be carefully informed about the risk of an unhealthy lifestyle during
402 the quarantine due to the increasing risk of disease. These subjects need careful
403 monitoring of their health and strong psychological support to reduce stress and anxiety.

404 Weight stigma is not uncommon in social media outlets such as Twitter, Facebook, and
405 Instagram and the recent COVID-19 quarantine has sparked social media posts that refer
406 to "quarantine-15". Social media posts that stigmatize obesity and mock or diminish real
407 struggles with weight and eating can be particularly harmful to individuals with obesity
408 who are actively trying to manage their weight. [86]

413 **Conclusions**

414 We need to be prepared to confront the likely increase in cardiovascular risk burden
415 following the pandemic. During quarantine we must promote healthy diet and physical
416 activity at home. After quarantine we need to re-evaluate the cardiovascular risk in
417 patients, assessing biometrical and metabolic parameters. Patients also need to be
418 evaluated by psychologist to early identify the persistence of anxiety and stress and/or
419 evolution to a post-traumatic syndrome. Global action supporting healthy Diet and
420 physical activity is mandatory to encourage people to return to a good lifestyle. This action
421 needs to be stronger for individuals of a low socio economic level that will suffer to a higher
422 degree from the inevitable restrictions and economic crisis following a vast and prolonged
423 quarantine.

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427

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Journal Pre-proof

Table 2

WHO guide for quarantine: “Stay physically active during self-quarantine”

(This guidance is intended for people in self-quarantine without any symptoms or diagnosis of acute respiratory illness. It should not replace medical guidance in case of any health condition.) Modify from WHO guide, freely available at

<http://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/novel-coronavirus-2019-ncov-technical-guidance/stay-physically-active-during-self-quarantine>

- **Take short active breaks during the day.** Short bouts of physical activity add up to the weekly recommendations. You may use the suggested exercises below as inspiration to be active every day. Dancing, playing with children, and performing domestic chores such as cleaning and gardening are other means to stay active at home.
- **Follow an online exercise class.** Take advantage of the wealth of online exercise classes. Many of these are free and can be found on YouTube. If you have no experience, be cautious.
- **Walk.** Even in small spaces, walking around or walking on the spot, can help you remain active. If you have a call, stand or walk around your home while you speak, instead of sitting down. If you can go outside to walk or exercise, be sure to maintain at least a 1-meter distance from other people.
- **Stand up.** Reduce your sedentary time by standing up whenever possible. Ideally, aim to interrupt sitting and reclining time every 30 minutes. Consider setting up a standing desk by using a high table or stacking a pile of books or other materials, to

continue working while standing. During sedentary leisure time prioritize cognitively stimulating activities, such as reading, board games, and puzzles.

- **Relax.** Meditation and deep breaths can help you remain calm.
- **Eat healthily and stay hydrated.** WHO recommends drinking water instead of sugar-sweetened beverages. Limit or avoid alcoholic beverages for adults and strictly avoid these in young people. Ensure plenty of fruits and vegetables, and limit the intake of salt, sugar and fat.

Table 1

What is know

- Quarantine and isolation are effective measures to reduce diffusion of infection and to prevent pandemic. However these conditions can induce depression, anxiety, anger, and stress.
- Stress, depression and anxiety induce people to eat sugar-rich food and drink alcohol to feel better.
- During quarantine and isolation people reduce physical activity, and also reduce relaxing activities (i.e. yoga)
- Apps for Smartphone can help to control diet and maintain personal ideal weight.
- After quarantine, economic crisis could maintain or sometimes worsen unhealthy lifestyle, mainly in individuals of a low socio-economic level.