Original Article

The Neonatal Mortality and Hospitalization Rate among High-Risk Neonates who Underwent Home Care Services

Abstract

Background: Low birth weight neonates often require intensive care. However, in the absence of resources, Home Care (HC) could replace theoretically the essential health care. HC was presented for high-risk neonates who were born in 2016 in Isfahan city as a national pilot study. The aims of this study were to evaluate the Neonatal Mortality Rate (NMR) and hospitalization rates in the HRNs who received HC during the neonatal period. **Materials and Methods:** In a cohort study without a control group that was performed during 2016–2017, 130 HRNs who received HC in the neonatal period in Isfahan city were evaluated during 1 year. Data about the neonates' gender, age, birth weight, gestational age, congenital anomalies, cause of death (in terms of prematurity and related problems), and age at death were gathered and analyzed using the Chi-square test, independent t-test, Mann–Whitney U test, and multiple linear regression tests. **Results:** Out of the 129 HRNs who had received HC and completed a 1-year follow-up period, one neonatal death occurred due to multiple anomalies. In this way, the NMR was estimated as 7.75 per 1000 live neonates. In addition, 86 cases (66.66%) were hospitalized for one time in the neonatal period, 10 (6.14%) cases for the second time, and one HRN for the third time for 10 days. **Conclusion:** About one-third of the HRNs who had previously received HC in the neonatal period did not require inpatient care. In addition, the neonatal and infant mortality rates were low.

Keywords: *Home care services, infant mortality, low birth weight, neonatal nursing*

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Introduction

Low Birth Weight (LBW) neonates included 8.4% of the newborns in Iran; 18.7% of the LBW neonates died during the first month of life,[1] while the Neonatal Mortality Rate (NMR) was 8.85 (5.24–14.74) per 1000 live births in Iran in 2018.[2] The High-Risk Neonates (HRNs) are those who have life-threatening conditions such as neonates weighing less than 2000 g, born before 34 weeks of the gestational age, and admitted to the Neonatal Intensive Care Unit (NICU). These neonates are at risk of death and obviously need intensive and sufficient care.[3] At least 15% of the newborns require health care in NICU due to their critical conditions.[4] Despite the extra management of their problems, HRNs suffer more hospitalization and mortality compared with the mature neonates.[5] For instance, 12.6% of the neonates admitted to the NICU of the Children's Medical Center in Tehran (a tertiary hospital in the capital of Iran) died within 1 year.[6] In other words, 22%–49.06% of the HRNs were re-hospitalized in the first year.[7-9]

These remarkable neonatal death could be prevented by facilitating NICUs, timely visits by the health workers, and proper management of the neonates' problems.[5] In developing countries and low-socioeconomic communities where these neonate health problems are more common and resources are scarce with limited access to qualified outpatient or inpatient health care, the HC could protect the neonates against some health problems and reduce the burden of the neonates' health problems.[10] The HC may be delivered by experienced nurses, focusing on essential health services such as training and empowerment of the mothers of the neonates (to perform maternal tasks particularly for the HRNs), skincare, exclusive breastfeeding, management of hyperbilirubinemia, apnea, and other primary health cases.[11] It is assumed that if the HC offered by the health care delivery system meets either the quantitative or qualitative

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standards, it is going to reduce the neonatal deaths,[12] re-hospitalization,[4,13] the incidence of neonates' problems,[14] and improve exclusive breastfeeding.[15] Based on the findings of previous studies, due to increasing the frequency of the patients who require long-term continuous care and the rapid increase in the health care costs for hospital services, providing services at home is inevitable.[11,12] However, the implementation cases of HC for HRNs in Iran are limited. The HC package for HRNs was introduced in 2016 in Isfahan city's health care delivery system as a pilot project. This project was implemented under the supervision of the neonatal health care office of the Iran's Ministry of Health, Treatment and Medical Education. This study was performed to evaluate the hospitalization rate, NMR, and the infant mortality rate (IMR) among the HRNs who were received HC in 2016 in Isfahan city.

Materials and Methods

This is a cohort study without a control group conducted between 2016 and 2017. The study's population included all 130 stable HRNs who were born in 2016 in one of the four teammate hospitals (Al Zahra, Amin, Isa Ibn Maryam, and Asgarya) in Isfahan city. The sampling was done through a census. This study was performed in the neonates with birth weight less than 1500 g and/or gestational age between 24 and 37 weeks and no longer needed intensive medical cases[16] and received HC in the first week after birth.

The HC package contained visiting the HRNs by experienced neonatal nurses after hospital discharge, training the neonates' families and their aiding with breastfeeding, even gavage through the nasogastric tube, apnea monitoring, assisting with nursery of the HRNs such as kangaroo mother care,[17] and evaluating the neonates for signs and symptoms that require any urgent intervention and if necessary, referring them to a physician in a timely manner.[18] HC was provided after obtaining the mothers' written consents and was offered free of charge to the families. HC was delivered continuously with the NICU services in four weeks after birth and in coordination with the neonatologists' orders. The nurses who had a good experience in health care in the NICU and were approved by the Deputy of Clinical Affairs of Medical University of Isfahan (MUI) were eligible to be employed and provide HC for the HRNs. These nurses belonged to a private company and their wages were paid through fees for services after quality control. The company received wages through a contract with the Deputy of Health of the MUI.

The first home visit was delivered the day after the discharge of the neonates from the NICU and focused more on training the family to meet the neonatal essential health needs. Other home visits were carried out at least every week during the neonatal period. Whenever the neonates' families requested more HC, they were provided with the services. The counseling sessions lasted on an average of 60 min. The nurses who delivered HC to the HRNs recorded all events and/or health services within the standard health files. The files were designed based on the national neonatal health services guidelines.[19]

The data related to the demographic variables such as gender, gestational age, birth weight, history of maternal disease, route of delivery, breastfeeding duration, hospitalization, occurrence of death, and the cause of death were gathered by researchers from their health files and recorded the checklists. One of the experts of the family and population office in the provincial health center had contacted to HRNs' families by telephone individually to complete the checklists precisely at the end of the neonatal period for each neonate to ensure the quality of HC. In this checklist, the level of the education and occupation of HRNs' families were categorized based on the Iranian literacy scale and classification of commercial occupations in Iran. The duration of breastfeeding was categorized in two intervals: from birth to 6 months and more than 6 months. The mothers' diseases were classified based on the main diseases that occurred in the perinatal period. The neonates' problems were categorized based on the health files that were completed by nurses who had delivered the HC. Data were analyzed using SPSS 16.0 software (SPSS Inc., Chicago, IL. USA). The categorical data were presented as frequency and percentage, but continuous data were presented as mean and standard deviation. We used the Chi-square test, independent t-test, Mann–Whitney U test, and multiple linear regression tests to clarify any relationships between HRNs' results and their demographic characteristics. The $p < 0.05$ was considered as significant.

Ethical considerations

The present study was performed based on the agreement of the ethics committee of Isfahan University of Medical Sciences with No.IR.MUI.REC.1396.3.650.

Results

Among the 130 high-risk neonates, 129 HRNs with a mean (SD) of gestational age as 34 (2.9) (range: 26–40) weeks and with the mean (SD) of birth weight as 1977.67 (504.95) (range: 820–3335) g were included in the present study. Forty-three neonates (33.1%) were twins. One HRN migrated to another province and despite many efforts, we could not find him. Forty-three HRNs (33.33%) were discharged from the hospital on the same day and referred to the teammates' nurses to receive the HC, and were never hospitalized until infancy, but 86 HRNs (66.66%) were hospitalized in the neonatal period for one time and 10 HRNs for the second time. Only one HRN was hospitalized for the third time for 10 days. The average length of stay in the hospital for HRNs was 6 days (0–75 days) in the present study. Other variables are mentioned in Table 1. The hospitalization rate of HRNs in the neonatal period is estimated at least 0.752.

Table 1: The demographic variables and the frequency of other risk factors of high-risk neonates who underwent home care in 2016 in Isfahan city

Variables	Categories	*n* (%)
Gender	Male	65 (50.39%)
	Female	63 (48.84%)
	Hermaphrodite	1 (0.77%)
Mothers' Education	Illiteracy	1 (0.77%)
	Primary School	16 (12.44%)
	Secondary School	63 (48.84%)
	University	49 (37.98%)
Fathers' Education	Illiteracy	3 (2.32%)
	Primary School	31 (24.02%)
	Secondary School	62 (48.06%)
	University	33 (25.58%)
Fathers' occupation	Worker	10 (7.75%)
	Employee	22 (17.05%)
	Business Man	97 (75.19%)
Mothers' occupation	Housewife	116 (89.93%)
	Employee	13 (10.07%)
Route of Delivery	Vaginal Delivery	27 (20.93%)
	Cesarean Section	102 (79.07%)
Neonates' Problems	Jaundiced	33 (25.58%)
	Fetal Complications	20 (15.50%)
	No Disease in Neonatal Period	7 (5.42%)
Breastfeeding	Up to 6 months	81 (62.79%)
	More than 6 months	48 (37.21%)
Mothers' Diseases in Perinatal Period	No Diseases	87 (67.44%)
	Preeclampsia	20 (15.50%)
	Any Rheumatologic Diseases	1 (0.77%)
	Diabetes Mellitus	7 (5.43%)
	Hypothyroidism	14 (10.85%)

In the following period, one HRN died. Thus, among 129 HRNs, the NMR would be 7.75 per 1000 born-alive neonates. According to the follow-up observation of HRNs, at the end of the first year, only one HRN had died in the neonatal period. Thus, the NMR and IMR would be estimated as 7.75 per 1000 live births. The mother of the dead neonate had been educated at the university level and her neonate was born through the cesarean section and had multiple anomalies. Following HRNs to the end of their first year of life, we did not find any other deaths, even in the infantile period. No statistical relationship was found between the neonates' problems, breastfeeding duration, and demographic characteristics of HRNs such as gender, the level of education, occupation of families, and the mothers' perinatal problems ($p > 0.59$).

As shown in Table 2, using the linear regression test, a negative correlation was observed between re-hospitalization times of the HRNs and variables such as father's education level, gestational age, birth weight, neonatal height, and head circumference at birth. However, using multiple linear regression, it was emphasized that the HRNs are frequently hospitalized who had a lower gestational age at birth ($p < 0.004$) and a lower father's education level ($p < 0.02$).

Discussion

According to our findings, the NMR and IMR in the present study were 7.75 per 1000 live births. Unfortunately, we could not find previous similar studies in Iran. The neonatal mortality rate was reported 6.56 per 1000 live births in Isfahan province in 2018.[20] Based on the literature, NMR is more common in HRNs; however, the NMR following HC in this study is close to the NMR reported in Isfahan province.[20] Based on the findings of the present study, a 12% reduction in NMR was obtained following the home visitation approach in sub-Saharan Africa and in south Asia,[12] while the NMR in Iran was 8.85 (5.24–14.74) per 1000 live births in 2018.[1,2] The NMR in the present study is lower than the reported cases at the national level. Thus, our results revealed that the NMR in the HRNs who received HC was almost lower than the NMR in normal cases in other parts of Iran.

According to the national study, the IMR was 12.39 per 1000 live births.[1,2] The IMR among those under12 months of age was 9.01 per 1000 live births in 2018, in Isfahan province.[20] Thus, the IMR in this study was lower than the provincial and national levels. This IMR was less than 37% that was reported in the Honda's study in Cambodia.[21] Based on the published papers, HC particularly for premature neonates could play an important role in managing neonatal problems and preventing neonatal mortality in developing countries with limited access to hospital facilities.[4,12-14]

The only dead neonate has occurred due to the multiple anomalies. Similarly, according to the Forouzanfar's study, congenital anomalies were the most common causes of death in children under 15 years age in Iran.[22] The rate of exclusive breastfeeding up to 6 months of age in HRNs was 62.79%. The intervention aimed at promoting breastfeeding for HRNs in the NICU in Rome increased the exclusive breastfeeding rate up to 55.5%.[23] In addition, no statistical difference was found between preterm neonates who were fed through a nasogastric tube and received tele-homecare after being discharged from the hospital and those neonates who were admitted to the NICU.[15] Besides, 85.7% of the low birth weight Turkish infants whose mothers underwent natural-feeding education, sustained exclusive breastfeeding until 6 months of age.[24] As a result, the coverage of exclusive breastfeeding in the HRNs was acceptable compared to the mentioned studies.

In the present study, 25.58% of the HRNs exhibited hyperbilirubinemia, while in the Saber's study, 53.5% of neonates presented jaundice.[25] It seems that the occurrence of hyperbilirubinemia in HRNs in the present study was lower than the previous study. Though all neonates were at high risks, 86 (66.66%) of them were hospitalized for one

Table 2: The correlation between re-hospitalization times of high-risk neonates who underwent home care in 2016 in Isfahan city

Variable	Univariate Analysis		Multivariate Analysis	
	OR (95% CI for OR)	p	OR (95% CI for OR)	p
Mothers age	1.02 (0.94-1.09)	0.59	-	-
Mother occupation*	1.14 (0.33-3.93)	0.83	-	-
Mother education**	0.95 (0.45-2)	0.89	-	-
Father age	1.03 (0.95-1.12)	0.37	-	-
Father occupation***	4.90 (0.6-40.08)	0.13	11.94 (0.98-144.67)	0.05
Father education****	0.18 (0.05-0.64)	0.008	0.14 (0.02-0.73)	0.02$
Perinatal complication****	0.91 (0.33-2.49)	0.86	-	-
Predisposing disease in neonates*****	1.26 (0.23-6.80)	0.74	-	-
Delivery route******	0.54 (0.22-1.3)	0.17	1.83 (0.35-9.40)	0.08
Gestational age (weeks)	0.53 (0.42-0.67)	<0.001	0.61 (0.44-0.85)	0.004$
Neonate gender*******	1.46 (0.69-3.1)	0.31	-	-
Neonatal jaundice*****	0.69 (0.3-1.58)	0.39	-	-
Neonatal weight at birth (gr)	0.99 (0.995-0.998)	<0.001	0.99 (0.99-1)	0.05
Neonatal height at birth (cm)	0.70 (0.60-0.82)	<0.001	1.12 (0.84-1.50)	0.41
Neonatal head circumference at birth (cm)	0.46 (0.34-0.63)	<0.001	0.85 (0.49-1.48)	0.57
Breastfeeding********	1.80 (0.85-3.81)	0.12	1.60 (0.48-5.33)	0.44

Reference Group: *house keeper, **Above the diploma, ***All groups except workers, ****Above the diploma, *****yes/no, ******cesarean, *******female, ********>6 months. $p is significant.

time. It seems that the rate of hospitalization in the present study is more than the previous mentioned studies.[7-9]

The average length of stay in the hospital for the HRNs in the present study was 6 days (0–75 days). While in our project, the HCs were delivered for HRNs for the first time; however, 33.33% of HRNs were never hospitalized. However, the average length of stay in hospital in the present study is lower than the Navaei *et al.*'s study.[26] Although the previous studies emphasized that HC reduces re-hospitalization rate,[4,13] to confirm it precisely, the comprehensive future studies accompanied by experienced nurses are required.

No statistical relationship was found between the neonates' problems, breastfeeding duration, and demographic characteristics of the HRNs. Based on a cohort study in France, the re-hospitalization was more common in the preterm male infants and living in the socioeconomic deprivation situations. But inversely re-hospitalization was less in those who resided in urban areas.[7] As shown in the Basiri *et al.*'s study in Hamadan province, the NMR was more common among male neonates, but the NMR was not correlated with the mother's age and co-infection.[27]

The present study was performed on the neonates whose parents resided exclusively in Isfahan city. Therefore, it could not be possible to distinguish the NMR between rural and urban areas. In addition, in contrast to the above-mentioned papers, except the fathers' education level, no relationship was found between re-hospitalization times, neonates' gender, the level of occupation and education of mothers, and fathers' occupation in the present study. It seems that the comprehensive HCs that were

delivered to the HRNs by well-trained nurses who were supervised by neonatologists, may have influenced many outcomes among HRNs regardless of their demographic characteristics.

Our findings revealed a significant linear negative correlation between the times of neonates' re-hospitalization and the neonates' weight and gestational age. Similar findings were reported in the Basiri *et al.*'s study in Hamadan province: the NMR was more common in neonates whose gestational age was less than 28 weeks, had low birth weight, and had a history of mother's disease in the past.[27]

In the present study, no correlation was found between re-hospitalization times and the route of delivery of HRNs. But on the contrary, it was shown in the Babaei *et al.*'s study that the cesarean section was a potential risk factor for neonatal death.[28] It is important to note that they compared the NMR between the normal and low birth weight neonates. If we considered that the only missing HRN is probably died in the infantile period, the IMR would be estimated as 15.4 per 1000 born-alive neonates. Hence, the IMR among HRNs in the present study is estimated to be lower than similar indicators in the normal community at the national level or indicators reported from other developing countries.[2,21]

It seems that launching well-designed comprehensive HCs that are delivered by experienced nurses could reduce the hospitalization needs of HRNs and play a protective role in the face of NMR. Although the comprehensive health care was delivered under the close supervision of specialist teams in the neonates' homes, this study was performed as

a pilot study with a limited sample size and also without a control group, and therefore requires future clinical trials with a control group.

Conclusion

Based on the results of the present study, the NMR and IMR among the stable HRNs who received HC earlier in the neonatal period were approximately lower than the results of the previous similar studies. In addition, one-third of HRNs were never hospitalized during the neonatal period. It seems that providing high-quality HC for HRNs could reduce the hospitalization and premature deaths of HRNs or improving the efficiency of health services in Iran. However, the results of the present study should be considered cautiously in other communities. They should even have access to well-trained nurses and cooperative families.

Conflicts of interest

Nothing to declare.

References

1. Caring for the Newborn at Home. World Health Organization. Available from: https://apps.who.int/iris/bitstream/handle/10665/204273/9789241549295_FacilitatorNotes_eng.pdf;jsessionid=79520B2A8BF08B0817B7525BCBBAA14D?sequence=2. [Last accessed on 2019 Aug 27].
2. Available from: https://childmortality.org/data/Iran%20(Islamic%20Republic%20of. [Last accessed on 2019 Aug 27].
3. Sadeghzadeh M, Khoshnevisasl P, Parvaneh M, Mousavinasab N. Early and late outcome of premature newborns with history of NICU admission at 6 years old in Zanjan, Iran. Iran J Child Neurol 2016;10:67-73.
4. Malak JS, Safdari R, Zeraati H, Nayeri FS. Mohammadzadeh N, Farajollah SS. An age-based architecture for high-risk neonate management at neonatal intensive care unit. Electron Physician 2018;10:6193–200.
5. Laugier O, Garcia P, Boucékine M, Daguzan A, Tardieu S, Sambuc R, *et al.* Influence of socioeconomic context on the rehospitalization rates of infants born preterm. J Pediatr 2017;190:174-9.e1.
6. Kadivar M, Sagheb S, Bavafa F, Moghadam L, Eshrati B. Neonatal mortality risk assessment in NICU. Iran J Ped 2007;17:325-31.
7. Chen T, Hu Y, Wan X. A retrospective analysis of unplanned hospital readmissions of high-risk neonates in a tertiary hospital. Chin J Practical Nur 2017;33:6-9.
8. Girgin BA, Cimete G. Rehospitalization of preterm infants according to the discharge risk level. J Spec Pediatr Nurs 2017;22. doi: 10.1111/jspn. 12165.
9. Gogia S, Sachdev HPS. Home-based neonatal care by community health workers for preventing mortality in neonates in low- and middle-income countries: A systematic review. J Perinatol 2016;36:S55-73.
10. Hanson C, Manzi F, Mkumbo E, Shirima K, Penfold S, Hill Z, *et al.* Effectiveness of a home-based counselling strategy on neonatal care. PLoS Med 2015;12:e1001881.
11. Liu Y, McGowan E, Tucker R, Glasgow L, Kluckman M, Vohr B. Transition home plus program reduces medicaid spending and health care use for high-risk infants admitted to the neonatal intensive care unit for 5 or more days. J Pediatr 2018;200:91-7.e3.
12. Kirkwood BR, Manu A, Asbroek AH, Soremekun S, Weobong B, Gyan T, *et al.* Effect of the new hints home-visits intervention on neonatal mortality rate and care practices in Ghana: A cluster randomized controlled trial. Lancet 2013;381:22-8.
13. Vohr B, McGowan E, Keszler L, Alksninis B, O'Donnell M, Hawes K, *et al.* Impact of a transition home program on rehospitalization rates of preterm infants. J Pediatr 2017;181:86-92.
14. Garne K, Brødsgaard A, Zachariassen G, Clemensen J. Telemedicine in neonatal home care: Identifying parental needs. JMIR Res Protoc 2016;5:e100.
15. Holm KG, Clemensen J, Brødsgaard A, Smith AC, Maastrup R, Zachariassen G. Growth and breastfeeding of preterm infants receiving neonatal tele homecare compared to hospital-based care. J Neonatal Perinatal Med 2019;12:277-84.
16. Pitt C, Tawiah T, Soremekun S, ten Asbroek AH, Manu A, Tawiah-Agyemang C, *et al.* Cost and cost-effectiveness of newborn home visits: Findings from the Newhints cluster-randomised controlled trial in rural Ghana. Lancet Global Health 2016;4:45-56.
17. Kangaroo mother care: A practical guide. Department of Reproductive health and Research. World Health Organization. Geneva 2003. Available from: https://books.google.com/books?hl=en&lr=&id=M2A0DgAAQBAJ&oi=fnd&pg=PP4&dq=Kangaroo+mother+care:+a+practical+guide.+Department+of+Reproductive+health+and+Research.+World+Health+Organization.+Geneva.+2003.&ots=NsRpxLnSio&sig=eBfE5iPjLGpIk6BhPUoXGYzP7Jo#v=onepage&q=Kangaroo%20mother%20care%3A%20a%20practical%20guide.%20Department%20of%20Reproductive%20health%20and%20Research.%20World%20Health%20Organization.%20Geneva.%202003.&f=false. [Last accessed on 2019 Aug 27].
18. Adamkin DH, Batton DG, Bell EF, Bhutani VK, Denson SE, Martin GI, *et al.* Hospital discharge of the high-risk neonate. Pediatrics 2008;122:1119-26.
19. Healthy baby service package. Neonatal Health administration. Office of Population, Family and School Health. Deputy of Health. Iranian Ministry of Health and Medical education. Available from: http://www.sbmu.ac.ir/uploads/nozad1.pdf. [Last accessed on 2021 Apr 10].
20. Khadivi R, Mirnasiry MS, Fazelian S, Aghababayi-Badi M. The rate and the causes of under-5- year-old children mortality in Isfahan Province, Iran, during the Years 2012-2018. J Isfahan Med Sch 2020;38:469-76.
21. Honda M, Som R, Seang S, Tung R, Iwamoto A. One-year outcome of high-risk newborn infants discharged from the

neonatal care unit of the National Maternal and Child Health Center in Cambodia. Heliyon 2019;5:e01446.

22. Forouzanfar MH, Sepanlou SG, Shahraz S, Dicker D, Naghavi P, Pourmalek F, *et al*. Evaluating causes of death and morbidity in Iran, global burden of diseases, injuries, and risk factors study 2010. Arch Iran Med 2014;17:304-20.

23. Dall'Oglio I, Salvatori G, Bonci E, Nantini B, D'Agostino G, Dotta A. Breastfeeding promotion in neonatal intensive care unit: Impact of a new program toward a BFHI for high-risk infants. Acta Paediatr 2007;96:1626-31.

24. Küçükoğlu S, Çelebioğlu A. Effect of natural-feeding education on successful exclusive breast-feeding and breast-feeding self-efficacy of low-birth-weight infants. Iran J Pediatr 2014;24:49-56.

25. Saber A, Ferdowsi SH, Askari F, Farsi L. The epidemiology of pathologic jaundice between neonates and its relationship with demographic characteristics between neonates in 22th Bahman of Gonabad Hospital. Razi J Med Sci 2013;20:42-8.

26. Navaei F, Aliabady B, Moghtaderi J, Moghtaderi M, Kelishadi R. Early outcome of preterm infants with birth weight of 1500 g or less and gestational age of 30 weeks or less in Isfahan city, Iran. World J Pediatr 2010;6:228-32.

27. Basiri B, Esna Ashari F, Shokouhi M, Sabzehei MK. Neonatal mortality and its main determinants in premature infants hospitalized in neonatal intensive care unit in Fatemieh Hospital, Hamadan, Iran. J Compr Ped 2015;6:e26965.

28. Babaei H, Dehghan M, Mohammadi Pirkashani L. Study of causes of neonatal mortality and its related factors in the neonatal intensive care unit of Imam Reza Hospital in Kermanshah during (2014-2016). Int J Pediatr 2018;6:7641-9.