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Institute of Nursing Research
College of Nursing, Korea University

발 간 사

서 문 경 애
간호학연구소장

안녕하십니까?

고려대학교 간호학연구소는 ‘간호서비스 산업화를 위한 방향’을 주제로 4차 산업혁명 시대를 이끄는 미래 간호 인재 양성을 중심으로 다각적인 연구와 국내외 학술대회를 진행해 왔습니다. 이를 통하여 간호영역에서의 연구와 실무의 산업화로 연계함으로써, 융복합시대의 간호의 역할에 대한 함의를 찾고 숨을 불어넣을 수 있는 장을 만들고자 노력해 왔습니다.

또한 2019년 한해도 연구위원들은 한국연구재단의 일반연구자사업 및 중견연구자사업과 지방자치단체 등으로부터 다양한 연구비를 지원받아 간호학연구소 발전은 물론, 미래 지향적이고, 창의적인 높은 수준의 연구 활동에 주력해 오고 있습니다.

고려대학교 간호학연구소는 급변하는 사회변화와 간호서비스의 산업화 요구에 부응하여 활발한 국제학술 심포지엄과 다양한 국내 학술활동 그리고 산학연 사업 개발 및 교육 연수 프로그램 등을 계획하고 시행할 것입니다. 또한 간호학연구소에서 발간하는 ‘간호학논집’은 연구영역의 결과물을 정리한 것으로써, 연구자 간의 정보교류에 도움이 되고 있습니다.

향후 간호학연구소는 보다 발전 지향적이고 국가와 사회에 기여하는 책임과 의무를 다할 것입니다.

앞으로도 많은 관심과 지속적인 지원을 부탁드립니다.

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목 차

- 발 간 사
- 조현병환자 가족의 가족건강성 예측모형 구축
..... 한금선, 홍영선, 강현철, 노연희, 최명숙, 문희진 ... 1
- Linalyl acetate prevents three related factors of vascular damage in COPD-like and hypertensive rats
..... Yu Shan Hsieh, You Kyoung Shin, A Young Han, Soonho Kwon, and Geun Hee Seol... 15
- Development and psychometric validation of the Menstrual Health Instrument (MHI) for adolescents in Korea
..... Hyunjeong Shin, Young-Joo Park, Inhae Cho ... 29

Contents

- ◇ **Developing a Prediction Model for Family Health in Families of Patients with Schizophrenia** Keum Sun Han/ Yeong Seon Hong/ Hyuncheol Kang/ Youn Hee Roh/ Myung Sook Choi/ Hee Jin Moon... **1**
- ◇ **Linalyl acetate prevents three related factors of vascular damage in COPD-like and hypertensive rats**
..... Yu Shan Hsieh/ You Kyoung Shin/ A Young Han/ Soonho Kwon/ and Geun Hee Seol... **15**
- ◇ **Development and psychometric validation of the Menstrual Health Instrument (MHI) for adolescents in Korea**
..... Hyunjeong Shin/ Young-Joo Park/ Inhae Cho ... **29**

조현병환자 가족의 가족건강성 예측모형 구축

한금선¹ · 홍영선² · 강현철³ · 노연희⁴ · 최명숙⁵ · 문희진⁶

서론

1. 연구의 필요성

조현병은 현실성을 잃어버리는 만성 정신질환이면서 인지, 지각, 행동 및 정서적, 사회적 기능상실을 가져오는 정신장애이다[1]. 조현병은 기능 퇴화로 인한 정신·심리·기능적 결함을 보이고 사회로 복귀한 후에도 사회적 장애를 보이면서 호전과 악화를 반복하며 재발률이 높아 치료에 장기화가 필요한 질병이다. 조현병의 원인이 무엇이든 일단 발병하게 되면 가족 내 다른 구성원들에게 부정적 영향을 미칠 수 있다[1,2]. 그 가족들은 환자를 간호하는 주요 자원체계가 되면서 환자의 질병에도 많은 영향을 미치게 되지만, 환자간호에 대한 부담감, 질병 증상에 대한 두려움과 당황스러움 및 질병 과정의 불확실성, 사회적 지원의 부족, 편견 등의 부담과 스트레스에 직면하게 된다[1-3].

가족들이 환자의 질병에 적응하면서 긍정적 지원자가 된다면 환자나 질병의 치료나 경과에도 매우 이익이 될 수 있지만, 정신질환자의 돌봄 역할은 결코 쉬운 일이 아니며 개인적 삶에도 많은 영향을 미치게 된다[2]. 특히 조현병 증상이 심각할 경우 취업과 결혼이 순조롭지 않

기 때문에 돌봄제공자들, 즉 가족들의 장기적인 이직, 일상생활의 어려움, 경제적 압박, 사회·여가 활동의 불편함을 가져오게 한다고 알려져 있다[2,3]. 조현병의 경우, 우울증 환자의 가족들에 비해 가족 내 상호작용 장애가 심하고, 고립감, 분노, 우울, 좌절감을 느끼며, 사회적 접촉을 더 꺼려 하고, 죄의식이나 낙인이 심하기 때문에 사회적 지원이 더 절실함을 강조하였다[3].

조현병을 포함한 정신질환자 가족이 경험하는 여러 어려움 중에서 일반인들의 정신질환에 대한 이해 부족으로 자신이 정신질환 가족이라는 사실을 숨기게 되고, 이로 인한 죄의식까지 경험하는 경우가 있다[4]. 이러한 죄의식은 자신감 및 자아존중감 저하로 이어지게 되고 돌봄을 제공하는 가족에게 사회적 위축과 낙인으로 남게 되어 가족들의 삶에 또 다른 위기를 야기할 수 있다[4,5]. 우리나라의 경우 정신건강증진 및 정신질환자 복지서비스 지원에 관한 법률을 계기로 지역사회 정신보건을 강조하는 정책의 강화에 따라 정신장애를 가진 사람들의 치료 과정에서 사회복지 서비스 지원이 강화되었지만, 그에 대한 파생 효과로 가족의 역할과 비중이 점점 커져가는 실정이고[5], 조현병 환자 가족의 스트레스와 낙인 등의 부정적인 감정이 가족의 기능에 지장을 주고 가족

Keywords: 조현병, 가족 건강, 사회적 낙인

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* Corresponding author: Hong, Yeong Seon

E-mail: youngsunny92@daum.net

건강성을 저해하는 주요 원인이 될 수 있다는 점에서 그 심각성이 있다.

가족은 사회변화에 따라 다양하게 영향을 받으면서 지속된 가장 기본이 되는 사회체계로서 현대 사회에서는 가족의 구성과 형태가 다양해졌으며, 이에 따라 가족의 의미와 가족 기능에 대한 인식도 변화하고 있다. 가족건강성에 대한 관점은 삶에 대한 긍정적인 관점으로 모든 가족은 강점을 가지고 있고 잠재적 역량이 있다고 가정한다[6,7]. 즉, 건강한 가족의 구성원은 안정적으로 자신을 돌볼 수 있고, 나아가 건강한 가족을 이룰 수 있는 가능성이 높기 때문에 가족의 긍정적인 측면인 건강에 중점을 두는 것이 미래에 긍정적 발전과 변화의 기본이 된다고 보았다[6]. 가족건강성 관련 연구의 경우, 1960년대 초반 미국의 가족학 연구에서 강한 가족(strong family)의 기능에 대한 개념이 논의된 후 많은 학자에 의해 진행되었고, 최근에는 가족의 장점을 강화하고 가족관계를 향상키는 방법에 대한 관점으로 연구가 진행되고 있다[7-10].

정리하면, 가족의 건강성에 대한 의미는 강한 가족, 기능적 가족, 균형 잡힌 가족, 건강한 가족 등의 개념으로 혼용되기도 하는데, 가족 구성원들의 발달을 도모하고, 가족들의 원만한 상호작용이 이루어지는 체계를 유지하며, 가족관계에 대한 만족도가 높으면서 서로의 욕구를 충족시킬 수 있는 가족으로 정의될 수 있다[7]. 가족의 스트레스 및 지지체계, 자아존중감, 가족탄력성, 의사소통 등이 가족건강성과 관련된 변수로 알려져 있으며[7,11], 이런 면에서 가족건강성은 가족 단위에서 경험하는 위기나 변화, 스트레스로부터 벗어나게 하고, 긍정적 측면을 강조하면서 가족의 관계적, 기능적인 면을 강화할 수 있으며, 건강성을 평가함으로써 가족 과정과 기능적 관계 및 정서적 유대감을 파악할 수 있는 가족 자원을 사정하는 기반이 될 수 있을 것이다.

이러한 가족의 기능적인 면을 조현병 가족에게 적용시킨다면, 가족의 강점을 강조하면서 위기에 적응하고 가족의 건강성을 회복 및 유지하기 위해 갖추어져야 할 중요한 선행요인으로 가족탄력성을 고려할 수 있다. 가족

탄력성은 가족을 하나의 기능적 단위로 보면서 가족이 위기 상황에 잘 적응하고 견디며 회복하는 원리로 설명된다[9]. Walsh [9]는 가족탄력성에 대해 첫째, 역경에 대해 의미를 부여하고, 긍정적 시각을 가지고 더 큰 가치와 목적을 지향하여 학습하고 성장한다는 신념체계를 강조하였다. 둘째, 가족의 유연성, 애착 및 사회적 경제적 자원의 동원을 통해 형성된다는 조직 과정, 마지막으로 명확성, 개방적인 감정공유, 협력적인 문제 해결을 하는 의사소통 및 문제해결 과정이라는 중요 개념이 포함 된다고 강조하였다.

가족탄력성은 가족이 높은 위험에 처한 상황에서 스트레스와 취약성을 감소시키고, 위기를 극복할 수 있도록 강화시키는 힘을 가지게 하는 역동적인 개념으로서[9,10], 탄력성 수준이 높은 가족은 같은 스트레스 상황에서 가족의 부담을 덜 느끼고 많은 자원과 지지를 찾을 수 있음은 물론, 가족 구성원들의 노력으로 심각한 트라우마 또는 어려움 속에서 삶의 과정과 시대를 넘어서 치유되는 잠재성과도 관련되어 있다고 알려져 있다[10]. 따라서 조현병 환자의 가족건강성과 탄력성의 긴밀한 관계성을 짐작할 수 있으며, 가족탄력성은 가족건강성에 능동적으로 영향을 주는 주요 개념으로 인식되기에[11], 조현병이라는 만성적 어려움을 겪는 가족들에게 든든한 심리적 자원이 될 수 있을 것이다.

또한 가족의 삶의 양식과 질을 향상시키고 통제력을 얻을 수 있도록 만드는 지식과 자원 및 기술에 접근하는 능력으로 정의되는 가족역량강화(family empowerment) 역시 가족건강성에 영향을 미치는 중요한 변수로 고려될 수 있다. 그 하위요인은 일상적인 상황에서 가족의 관리 능력인 가족체계, 환자가 필요로 하는 서비스를 받는 과정 중 기관과 전문가들과 소통하고 협조할 수 있는 능력을 말하는 서비스체계, 그리고 조현병 환자들을 위한 입법, 정책 입안, 기관 및 지역사회 구성원들을 대상으로 지지와 옹호를 내용으로 하는 지역사회·정치체계 수준 등으로 구성되어 있다[12]. 조현병 가족들의 대부분은 전문가들과 의료인에 의지하여 돌봄의 역할을 수행하고 있지만, 역량강화되면서 보다 적극적인 의사결정을 하고

자신의 삶을 주체적으로 전환할 수 있다는 점에서 역량 강화의 의의가 클 것이다. 따라서 탄력성과 역량강화 두 요인 모두 조현병 환자 가족이 직면하는 스트레스 상황에서, 그 수준의 향상을 통해 가족의 안녕과 긍정성을 이루게 하고, 기능적 능력을 파악하여 평가하는 데 중요한 기반이 될 것이다.

그 외에도 가족의 건강성에 영향을 줄 수 있는 자아존중감이 있다. 개인의 가치를 인정하고 타인의 존중을 인지하는 것으로 표현되는 자아존중감은 가족 구성원과의 관계에서 적용되고 있는 핵심적인 개념으로서 건강한 가족의 경우 자아존중감이 높은 경우 가족원 간 유대감이 좋고, 대화가 잘 이루어지며, 문제를 잘 해결하고 공유하는 가치체계를 가진다고 하였다[13]. 하지만 낙인을 강하게 지각할수록 자아존중감은 심각하게 손상을 입게 되는데, 정신질환자의 가족의 낙인은 자아존중감과 부적 상관관계가 있는 것으로 알려져 있어[5] 가족의 심리적 건강 수준에 부정적 영향을 미치는 요인이 될 수밖에 없다. 이러한 심리적 위축은 나아가 환자에게 지원체계로서의 역할을 악화시키는 물론 현실도피나 사회성 결여로 확대될 수 있는 여지가 많으므로 반드시 다루어져야 할 가족 간호의 개념으로 여겨져야 할 것이다.

일반적인 가족과는 다르게 심각한 갈등과 취약한 상황에 놓여 있어 지지와 극복이 필요한 조현병 환자 가족은 또 하나의 간호 대상이 될 수밖에 없으며, 구성원들의 정신적·정서적 건강을 유지하기 위해서는 가족 단위에서 건강성을 알아보고, 그에 따른 간호계획이 필요할 것이다. 따라서 가족의 기능과 역량강화를 통한 가족의 건강성을 도모하기 위한 목적으로 그에 영향을 미치는 개념 및 변인을 알아보는 것은 매우 의미 있고 중요한 과정이다.

현재까지 이루어진 조현병 환자 가족에 대한 연구는 정신질환 가족으로서의 삶에 대한 어려움과 스트레스 상황에 대해 논의하고, 지원체계로서의 가족의 역할을 강조하면서 그 기능을 향상시킬 수 있는 방안을 탐구하는 연구가 대부분이었다[1-5]. 따라서, 본 연구는 조현병 환자 가족을 대상으로 가족탄력성이라는 개념적 틀을 통해

가족 강화요소 중 가족건강성을 설명하는 변수들의 직·간접 영향력과 인과성을 알아보고, 가족을 단위로 하는 역량강화와 자아존중감 증진을 위한 간호에 대한 자료를 제공할 것이다.

2. 연구목적

본 연구는 조현병 환자 가족의 가족건강성에 영향을 주는 변인들의 인과적 관계와 영향력을 설명하는 가설적 모형을 구축하고, 이를 검증하기 위한 것이다. 구체적인 목적은 다음과 같다.

첫째, 선행연구와 관련 문헌을 근거로 조현병 환자 가족의 가족건강성을 설명하는 가설적 모형을 구축한다.

둘째, 선행연구와 관련 문헌을 바탕으로 조현병 환자 가족의 가족건강성에 영향을 미치는 변수들의 인과적 관계를 경로로 제시한다.

셋째, 실제 자료를 근거로 한 가설적 모형의 적합도 검증을 통해 가족건강성을 설명하고 예측하는 구조모형을 제시한다.

3. 개념적 틀

본 연구에서는 선행연구결과를 기반으로 돌봄 제공자인 조현병 환자 가족의 가족건강성을 예측하는 데 직·간접 영향력이 있다고 판단되는 내생변수 및 외생변수를 중심으로 개념적 틀을 구성하였다(Figure 1). 이 변수들은 가족건강성을 증진 또는 악화시킬 수 있으며, 가족의 건강성을 예측하는 데 있어서 가족의 안녕과 긍정성 및 기능성을 평가하는 데 중요한 기반이 될 것이다.

체계이론에서의 가족이란, 상호의존적인 존재이고 가족원 간의 관계를 중심으로 상호작용이 가족을 변화시켜 개인의 문제를 해결할 수 있다고 보았다[14]. 즉, 체계이론을 가족에게 적용하면 가족 구성원의 개개인은 부분들의 합 이상인 전체로서 구성원을 단순히 합쳐 놓은 것 이상의 가족체계가 형성된다. 상호의존성을 가족의 역할에 관련 짓는다면, 체계적으로 규정된 위치에 있는 사람들의 지각

과 행동에는 끊임없는 상호소통이 이루어지고, 개개인의 행동과 외부와의 반응 결과가 가족 전체에 영향을 미칠 수 있음을 짐작할 수 있다.

Yoo 등[6]은 가족을 하나의 시스템으로 보고 그 주요 관점은 가족 내부적인 행동 작용에 맞춰지면서 가족 내에서의 가족 과정(family process), 가족관계에 초점을 맞추고 있으며, 가족의 건강은 가족원 개개인의 건강한 발달의 도모, 가족원 간의 상호작용이 원만하며, 집단으로서의 공유하는 가치체계를 가지고 함께 생활해 가는 공동체로 설명하였다. 선행연구에서의 가족건강성 특성은 국외의 경우 가족의 성공이나 잠재력 개발과 성장에 좀 더 집중하는 경향이 있고[8-10], 국내의 경우 가족 간의 스트레스 및 갈등을 통제하고 관리하기 위한 구성원들의 개인역량과 관련된 탄력성, 사회적 지원체계, 긍정적 상호작용을 반영하는 가족건강성을 유지하고 향상시키려는 데 중점을 두고 있다[6,7,15]. 가족의 체계이론 관점과 가족건강성에 대한 의견을 종합해 보면, 가족은 서로 영향을 미치는 하나의 살아있는 체계로서 외적인 영향에도 불구하고 안정성을 유지하는 항상성을 가지고 있어 구성원의 질병은 가족의 항상성에 위협이 될 수 있음을 짐작할 수 있다. 더불어 가족 개인의 가치나 잠재력 등의 긍정요소뿐만 아니라 위기와 위협요인도 상호작용을 하는 가족이라는 사회적 틀 전체가 공유하는 건강상의 어려움이 될 수 있을 것이다.

선행문헌을 고려해 볼 때, 조현병은 발병 시 가족 구성원들에게 부정적 영향을 미치게 되며, 가족들이 환자들을 간호하는 동안 일반 신체질환자를 돌보는 가족들에 비해 높은 수준의 부담감과 스트레스를 경험한다[1,2]. 또한 가족들이 부담하는 환자들의 돌봄 역할이 개인적인 삶에도 많은 영향을 미치게 되어 일상생활 및 경제적 어려움을 초래하고, 다른 장애를 가진 사람에 비해 심리사회적 고충은 물론, 죄의식이나 낙인이 심해진다[3]. 특히 가족들이 갖는 죄책감은 가족들을 우울하게 만들고, 자아존중감을 떨어뜨릴 수 있으며, 환자의 가족들이 자신의 가족 중 정신질환자가 있다는 사실을 숨기게 되고, 타인에게 솔직해지기를 두렵게 만든다[4]. 이러한 정신적 질병 과정 중의 환자들을

돌보는 가족들의 사실적 정서이자 가족의 심리적·기능적 위기를 초래할 수 있는 심리적 변수로 가족스트레스와 사회적 낙인을 설정하였다.

가족건강성의 의미에 초점을 두게 되면, 모든 가족은 강점을 가지고 있고 잠재적 역량이 있다고 가정하였고, 이는 스트레스 상황이나 위기감에 대처할 수 있는 자원이 될 수 있다고 하였다[6]. 따라서 가족의 건강성에 긍정적인 영향력을 미칠 수 있는 변수이자 부정적 환경이나 변화에 잘 적응하고 회복할 수 있음을 보여주는 변수로 가족탄력성을 설정하였다[9,12]. 조현병 환자들의 경우 대부분 전문가들과 의료인에 의지하여 가족들이 돌봄의 역할을 수행하고 있지만[5], 보다 적극적인 의사결정을 하고 자신의 삶을 주체적으로 전환할 수 있는 역량강화가 될 수 있다면, 가족들 삶의 양식과 질을 한 단계 더 향상시키고 지식과 자원을 확보할 수 있는 자신감을 불어 넣을 수 있을 것이다[13]. 따라서 이러한 역량 변화를 통해 가족건강성에 보다 활기를 불어 넣어줄 잠재력이 될 수 있는 변수로 가족역량강화를 설정하였다.

자아존중감은 자신을 긍정적 또는 부정적으로 평가하는 자기존중의 정도이고, 자신의 가치를 통해 가족구성원 간의 관계성에 영향을 주는 핵심적인 개념이다[5]. 또한 개인의 특성이지만 가족 구성원들 간의 유대감이나 공유 가치체계에 영향을 줄 수 있는 요소로 인식되어 자아존중감이 높으면 가족을 긍정적으로 바라볼 수 있게 되므로[16], 자신이 갖는 여유로움으로 인해 가족관계를 건강하게 만들 수 있게 하는 자아존중감을 가족건강성에 영향을 미치는 변수로 포함하였다. 사회통합은 당사자의 참여와 임파워먼트, 지역사회 지지, 가치 있는 자원에 대한 접근을 강조하면서, 사회적 지지자원의 활용이 가족 간의 갈등 해결에 도움을 줄 수 있는 역할이 가능하게 한다[17]. 조현병의 경우, 지역사회 정신보건을 강조하는 정책과 관련법에 따라 사회복지 서비스 지원이 필수적이고, 치료과정을 함께하는 가족에게 수고를 덜어줄 수 있는 방안으로 필요성이 증대될 수 있으므로[5], 가족건강성에 영향력을 가질 수 있는 변수에 포함시켰다.

따라서, 본 연구는 가족건강성에 영향을 미칠 수 있는 긍정적 요인으로서 가족탄력성, 가족역량 강화, 자아존중감, 지역사회통합을 설정하고, 부정적 요인으로서 가족스트레스와

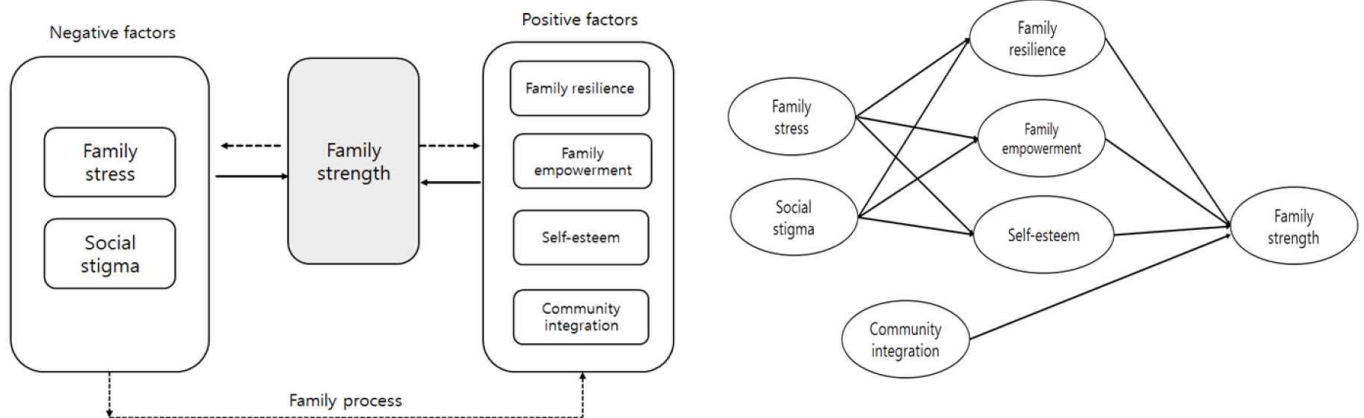


Figure 1. Conceptual framework and the hypothetical model.

사회적 낙인을 설정하여 가족건강성과의 관계를 알아보고자 하였다. 이에 따라 변수들의 관계 및 설명력을 알아보기 위한 가설적인 모형을 세우고 검증하였다(Figure 1).

지 내용을 이해할 수 있고, 본 연구에 참여하기로 자발적으로 동의한 가족이다.

연구방법

1. 연구설계

본 연구는 조현병 환자 가족의 가족건강성을 예측하는 가족스트레스, 사회적 낙인, 가족탄력성, 가족역량강화, 자아존중감, 및 지역사회통합 변인들과의 관계 및 설명력을 알아보기 위해 가설적 모형을 구축하고, 모형의 적합도를 검증하여 변수들 간의 관계를 탐구하는 구조방정식 모형 연구이다.

2. 연구대상

본 연구의 근접 모집단은 정신건강의학과 전문의로부터 조현병을 진단을 받은 후 치료 기간이 최소 1년 이상이 지난 현재 동거 중인 가족들을 대상으로 하였고, 일개 도시와 경기도 일개 지역에 거주하면서 정신건강복지센터를 방문하는 조현병 환자 가족을 표적 모집단으로 하였다. 연구 대상의 선정기준은 만 20세 이상의 남·여성인으로 현재 가족 중 조현병 환자와 거주하면서, 설문

3. 연구도구

1) 가족스트레스

McCubbin 등[18]이 개발한 Family Inventory of Life Event and Changes 척도를 원 개발자의 승인을 받은 후 번역·역번역 과정을 진행한 후 전문가의 타당도를 검증을 받고 사용하였다. 25개 문항의 5점 Likert 척도이며, 점수가 높을수록 스트레스 인식수준이 높음을 의미한다. 도구의 신뢰도는

도구개발 당시 Cronbach's $\alpha = .86$ 이었고, 본 연구에서는 .93이었다.

2) 사회적 낙인

Hwang 등[19]이 개발한 내재화된 낙인 척도 (Internalized Stigma Scale)를 원 개발자의 승인을 받은 후 사용하였다. 29개 문항의 5점 Likert 척도로, 점수가 높을수록 사회적 낙인 수준이 높음을 의미한다. 도구의 신뢰도는 개발 당시 Cronbach's $\alpha = .91$ 이었고, 본 연구에서는 .97이었다.

3) 가족탄력성

Walsh [9]가 개발한 가족탄력성 척도(Family

Resiliency Scale)를 본 도구는 원 개발자의 승인을 받은 후 전문가의 타당도를 검증받고, 번역·역번역한 후 사용하였다. 32개 문항의 5점 Likert 척도로, 점수가 높을수록 가족 탄력성의 수준이 높음을 의미한다. 도구의 Cronbach's α 는 개발 당시 .92였고, 본 연구에서는 .97이었다.

4) 가족역량강화

Jung [13]이 개발한 가족역량강화 척도(Family Empowerment Scale)를 원 개발자의 승인을 받은 후 사용하였다. 15개 문항의 5점 Likert 척도로 점수가 높을수록 가족역량 수준이 높음을 의미한다. 도구의 신뢰도는 개발 당시 전체 Cronbach's α = .88이었고, 본 연구에서는 .93이었다.

5) 자아존중감

Rosenberg가 개발하였으며, 이후 Morris Rosenberg Foundation에서 학술연구 및 교육용으로 사용을 허가한 Rosenberg Self Esteem Scale 을 Min과 Jeong [5]의 연구에서 번역한 것을 사용하였다. 본 도구는 총 10개 문항의 5점 Likert 척도로 점수가 높을수록 자아존중감이 높음을 의미한다. 도구의 신뢰도는 개발 당시 Cronbach's α = .92였고, 본 연구에서는 .95였다.

6) 지역사회 통합

Choi [17]가 개발한 지역사회 통합 척도(Community Integration Scale)를 원 개발자의 승인을 받은 후 사용하였다. 27개 문항의 5점 Likert 척도로 점수가 높을수록 지역사회 통합 수준이 높음을 의미한다. 도구의 신뢰도는 개발 당시 Cronbach's α = .92였고, 본 연구에서는 .95였다.

7) 가족건강성

Yoo 등[6]이 개발한 한국형 가족건강성 척도(Korean Family Strength Scale-II)를 원 개발자의 승인을 받은

후 하위요인 중 가족탄력성을 제외한 후 사용하였다. 총 15개 문항의 5점 Likert 척도이며, 점수가 높을수록 가족의 건강성 수준도 높음을 의미한다. 도구의 신뢰도는 도구개발 당시 Cronbach's α = .94였고, 본 연구에서는 Cronbach's α = .93이었다.

4. 자료수집 및 표본 수

2016년 8월 일개 대학교 생명윤리심의위원회의 심의를 통과한 후(KU-IRB-16-121-A-1), 구조화된 자가 기입식 설문지를 연구자가 정신건강복지센터의 협조 하에 동의를 취득한 후 조현병 환자 가족에게 배부하였다. 설문지를 작성한 대상자에게는 소정의 답례품을 전달하였다.

최대우도추정법(Maximum Likelihood Estimation)을 이용하여 구조방정식 모형분석을 하는 경우 일반적으로 추천되는 표본수는 150~400이며, 일반적인 표본수는 200을 단일 기준치로 사용한다[7]. 따라서 본 연구는 수거율과 기입 오류 및 결측 자료를 고려하여 총 260부를 배부하여 수거된 설문지 206부를 대상으로 자료분석을 하였다.

5. 자료분석방법

수집된 자료는 Predictive Analytic Soft Ware (PASW) 18.0 Program과 AMOS 18.0을 이용하여 통계처리하였으며, 구체적인 분석 방법은 다음과 같다.

첫째, 대상자의 사회인구학적 특성 및 주요 변수들의 차이검정을 위해 기술적 통계(빈도, 백분율, 평균, 표준편차 등), t-test, χ^2 -test, one-way ANOVA를 실시하였다.

둘째, 도구의 신뢰도는 Cronbach's α 값을 산출함으로써 제시하였다.

셋째, 가설적 모형의 적합도 검증 및 구조모형의 경로계수의 유의성, 직접효과, 간접효과 및 총 효과에 대한 유의성을 다음과 같이 확인하였다.

- 변수들 간의 상관성은 상관분석(Pearson correlation coefficient)을 이용하여 확인하였다.
- 구조모형검증은 다변량 정규성을 가정하는 최대우

도법을 이용하였다.

- 구조모형의 적합도 평가는 절대적합지수인 χ^2 , Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Comparative Fit Index (CFI), Normed Fit Index (NFI), Tucker-Lewis Index (TLI), Root Means Square Error of Approximation (RMSEA), Akaike Information Criterion (AIC) 등을 이용하였다.
- 모형의 직접효과, 간접효과 및 총 효과의 통계적 유의성 검증을 위해 부트스트래핑(bootstrapping)을 사용하였다.

연구결과

1. 대상자의 일반적 특성

본 연구 대상자 수는 총 206명으로 대상자 본인의 일반적 특성의 경우, 20~40세 미만이 27명(13.1%), 40~60세 미만이 95명(46.2%), 60세 이상이 84명(40.7%)이었다. 성별은 남자가 82명(39.8%), 여자가 124명(60.2%)이었다. 결혼 상태는 미혼이 31명(15.1%), 기혼이 117명(56.8%), 이혼이 18명(8.7%), 사별 및 기타가 40명(19.4%)이었다. 교육 수준은 중학교 졸업 이하가 76명(36.9%), 고등학교 졸업이 80명(38.8%), 대학교 졸업 이상이 50명(24.3%)이었다. 직업은 직장인이 35명(17.0%), 사업인이 14명(6.8%), 서비스 직종이 16명(7.8%), 가사 업무자가 36명(17.4%), 무직 및 기타가 105명(51.0%)이었다. 종교는 기독교가 78명(37.9%), 천주교가 25명(12.1%), 불교가 29명(14.1%), 무교 및 기타가 74명(35.9%)이었다. 가족들의 월 평균 수입은 100만원 이하가 57명(27.7%), 100~200만원 미만이 36명(17.5%), 200~300만원 미만이 47명(22.8%), 300~400만원 미만이 29명(14.1%), 400만원 이상이 37명(17.9%)이었다. 환자와의 관계는 아버지가 30명(14.6%), 어머니가 90명(43.7%), 배우자가 29명(14.1%), 형제가 34명(16.4%), 자녀가 15명(7.3%), 그 외의 관계가 8명(3.9%)이었다.

Table 1. Demographic Characteristics of Families of Patients and Schizophrenia Patients (N=206)

Variables	Characteristics	Categories	n (%)
Families of patients	Age (year)	20~39	27 (13.1)
		40~59	95 (46.2)
		≥ 60	84 (40.7)
	Gender	Men	82 (39.8)
		Women	124 (60.2)
	Marital status	Not married	31 (15.1)
		Married	117 (56.8)
		Divorced	18 (8.7)
		Bereavement & etc.	40 (19.4)
	Educational level	≤ Middle school	76 (36.9)
		High school	80 (38.8)
		≥ College	50 (24.3)
	Job	Salary man	35 (17.0)
		Business man	14 (6.8)
		Service worker	16 (7.8)
		Homemaker	36 (17.4)
		Unemployed & etc.	105 (51.0)
	Religion	Christian	78 (37.9)
		Catholic	25 (12.1)
		Buddhist	29 (14.1)
		Uncivilized & etc.	74 (35.9)
	Monthly income of family (10,000 won)	< 100	57 (27.7)
		100~199	36 (17.5)
		200~299	47 (22.8)
		300~399	29 (14.1)
		≥ 400	37 (17.9)
Patients	Relationship	Father	30 (14.6)
		Mother	90 (43.7)
		Spouse	29 (14.1)
		Sibling	34 (16.4)
		Children	15 (7.3)
		Etc.	8 (3.9)
	Age (year)	< 20	4 (1.9)
		20~39	73 (35.4)
		40~59	105 (51.0)
		≥ 60	24 (11.7)
	Gender	Men	86 (41.7)
		Women	120 (58.3)
	Marital status	Not married	129 (62.6)
		Married	50 (24.3)
		Divorced	15 (7.3)
		Bereavement & etc.	12 (5.8)
	Educational level	≤ Middle school	43 (20.9)
		High school	113 (54.8)
		≥ College	50 (24.3)

조현병 환자의 일반적 특성의 경우, 20세 미만이 4명(1.9%), 20~40세 미만이 73명(35.4%), 40~60세 미만이 105명(51.0%), 60세 이상이 24명(11.7%)이었다. 성별은 남자가 86명(41.7%), 여자가 120명(58.3%)이었다. 결혼 상태는 미혼이 129명(62.6%), 기혼이 50명(24.3%), 이혼이 15명(7.3%), 사별 및 기타가 12명(5.8%)이었다. 교육 수준은 중학교 졸업 이하가 43명(20.9%), 고등학교 졸업이 113명(54.8%), 대학교 졸업 이상이 50명(24.3%)이었다(Table 1).

2. 주요 변수의 상관관계

변수들 간의 상관관계는 다음과 같다. 가족건강성은 가족스트레스($r=-.16, p<.05$), 사회적 낙인($r=-0.26, p<.001$), 가족탄력성($r=.64, p<.001$), 가족역량강화($r=.58, p<.001$), 자아존중감($r=.62, p<.001$), 지역사회통합($r=.55, p<.001$)과 유의한 상관관계를 나타냈고, 지역사회통합은 가족스트레스($r=-.27, p<.001$), 사회적 낙인($r=-.38, p<.001$), 가족탄력성($r=.62, p<.001$), 가족역량강화($r=.59, p<.001$), 자아존중감($r=.62, p<.001$)과 유의한 상관관계를 나타냈다. 자아존중감은 가족스트레스($r=-.22, p<.01$), 사회적 낙인($r=-.32, p<.001$), 가족탄력성($r=.63, p<.001$), 가족역량강화($r=.60, p<.001$)와 유의한 상관관계를 나타내었고, 가족역량강화는 가족스트레스($r=-.04, p<.05$), 사회적 낙인($r=-.16, p<.05$), 가족탄력성($r=.78, p<.001$)과 유의한 상관관계를 나타내었다. 가족탄력성은 가족스트레스($r=-.18, p<.01$), 사회적 낙인($r=-.24, p<.001$)과 유의한 상관관계를 나타내었고, 사회적 낙인은 가족스트레스($r=.65, p<.001$)와 유의한 상관관계를 나타내었다.

3. 가설적 모형의 적합도 검증

본 연구에서는 조현병 가족의 가족건강성에 영향을 미치는 영향을 알아보기 위해 구조모형을 구축하였다. 본 연구의 가설적 모형은 2개의 외생변수(가족스트레스, 사회적 낙인)와 5개의 내생변수(가족탄력성, 가족역량강화, 자아존중감, 지역사회통합, 가족건강성)로 구성하였다. 가설적 모형을 요약하면, 가족탄력성, 가족역량강화, 자아존중감, 지역사회 통합은

가족건강성에 직접적으로 영향을 미치며, 가족스트레스, 사회적 낙인은 간접적으로 영향을 미치는 것으로 경로를 설정하였다

본 연구의 가설적 모형은 카이제곱(χ^2)이 412.86 ($p<.001$)이었다. GFI, AGFI, CFI, NFI, TLI는 .90이 넘으면 모형이 우수하다고 판단하고, RMSEA는 .05 이하면 우수하고 .08 이하면 수용할 수 있는 범위로 인정한다. 이들 적합도는 GFI .60, AGFI -.86, CFI .44, NFI .44, TLI -.97, RMSEA .57, AIC 456.86으로 적합도가 기준을 만족시키지 않음을 알 수 있었다. 따라서 가설적 모형은 전반적 적합도 지수 등을 고려해 볼 때 수정모형이 필요함을 알 수 있었다(Table 2).

4. 수정모형의 적합도 검증 및 경로계수

가설적 모형의 적합도 분석결과, GFI, AGFI, CFI, NFI, TLI (NNFI), RMSEA의 적합도가 기준을 만족시키지 못하고 계수의 부호가 맞지 않아 가설적 모형을 일부 수정하였다. 가족스트레스에서 가족탄력성, 자아존중감, 지역사회 통합 및 가족건강성으로 가는 경로와 사회적 낙인과 가족역량강화에서 가족건강성으로 가는 경로를 삭제 및 수정하여 모형의 적합도가 허용 기준을 만족하는 수정모형을 구축하였다 (Figure 2). 수정모형의 적합도는 카이제곱치(χ^2)가 1.97 ($p=.92$)이고, GFI .99, AGFI .99, CFI 1.00, NFI .99, TLI 1.00, RMSEA <.01, AIC 45.97로 적합도가 가설적 모형에 비해 기준치를 만족시킬 만큼 향상되었다(Table 2).

본 연구의 수정모형의 각 경로에 대한 표준화된 경로계수 값과 구체적인 분석결과는 Table 3과 같다. 사회적 낙인($\beta =-.24, p<.001$)은 가족탄력성에 유의한 직접영향을 미치는 것으로 나타났고, 가족탄력성을 설명하는 정도는 6.0%였다. 가족 스트레스($\beta =-.14, p<.05$)는 가족역량강화에 유의한 직접영향을 미치는 것으로 나타났고, 사회적 낙인($\beta =-.25, p<.01$)은 가족역량강화에 유의한 직접영향을 미치는 것으로 나타났으며, 가족스트레스와 사회적 낙인이 가족역량강화를 설명하는 정도는 4.0%였다. 사회적 낙인($\beta =-.32, p<.001$)은 자아존중감에 유의한 직접영향을 미치는 것으로 나타났고, 자아존중감을 설명하는 정도는 10.0%였다. 사회적

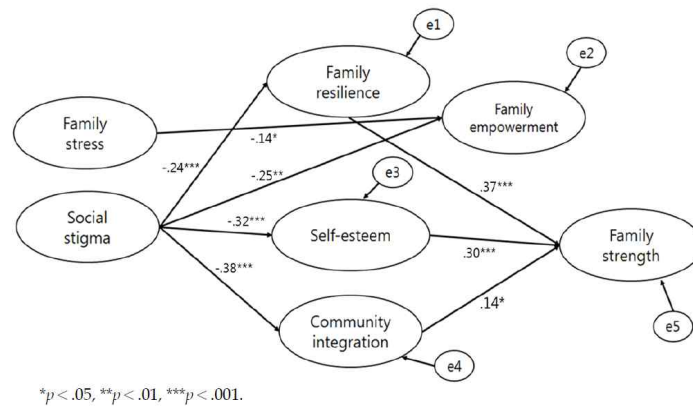


Figure 2. Pathway of modified model.

Table 2. Comparison of Model Fit of Modified Model to Hypothetical Model

Model	$\chi^2 (p)$	df	GFI	AGFI	CFI	NFI	TLI	RMSEA	AIC
Hypothetical model	412.86 (< .001)	6	.60	-.86	.44	.44	-.97	.57	456.86
Modified model	1.97 (.920)	6	.99	.99	1.00	.99	1.00	< .01	45.97

df=degree of freedom; GFI=goodness-of-fit index; AGFI=adjusted goodness of fit index; CFI=comparative fit index; NFI=normed fit index; TLI=Tucker-Lewis index; RMSEA=root means-square error of approximation; AIC=Akaike information criterion.

Table 3. Standardized Direct, Indirect, and Total Effects for the Final Model

Endogenous variables	Exogenous variables	SE	β	CR (p)	SMC	Direct effect (p)	Indirect effect (p)	Total effect (p)
Family resilience	Social stigma	.06	-.22	-3.61 (< .001)	.06	-.24 (< .001)	-	-.24 (< .001)
Family empowerment	Family stress	.06	-.15	2.56 (< .05)	.04	-.14 (< .05)	-	-.14 (< .05)
	Social stigma	.07	-.21	-3.21 (< .01)		-.25 (< .01)	-	-.25 (< .01)
Self-esteem	Social stigma	.06	-.31	-4.80 (< .001)	.10	-.32 (< .001)	-	-.32 (< .001)
Community integration	Social stigma	.05	-.32	-5.95 (< .001)	.15	-.38 (< .001)	-	-.38 (< .001)
Family health	Social stigma	-	-	-	.50	-	-.24 (< .01)	-.24 (< .01)
	Family resilience	.07	.36	5.35 (< .001)		.37 (< .001)	-	.37 (< .001)
	Self-esteem	.06	.27	4.41 (< .001)		.30 (< .001)	-	.30 (< .001)
	Community integration	.07	.15	2.07 (< .05)		.14 (< .05)	-	.14 (< .05)

SE=standard error; CR=critical ratio; SMC=squared multiple correlations.

논의

낙인($\beta = -.38$, $p < .001$)은 지역사회통합에 유의한 직접영향을 미치는 것으로 나타났고, 지역사회통합을 설명하는 정도는 15.0%였다. 가족탄력성($\beta = .37$, $p < .001$), 자아존중감($\beta = .30$, $p < .001$), 지역사회통합($\beta = .14$, $p < .05$)은 가족건강성에 유의한 직접영향을 미치는 것으로 나타났고, 사회적 낙인($\beta = -.24$, $p < .01$)은 가족건강성에 유의한 간접영향을 미치는 것으로 나타났다. 사회적 낙인, 가족탄력성, 자아존중감, 지역사회통합이 가족건강성을 설명하는 정도는 50.0%였다.

본 연구는 조현병 환자 가족의 가족건강성에 영향을 주는 변수들 간의 가설적 모형을 구축하였고, 영향력을 파악하기 위해 실시되었다. 또한 결과 변수인 가족건강성을 설명하는 설명력을 확인하고자 하였다. 본 연구에서 사회적 낙인, 가족탄력성, 자아존중감, 및 지역사회통합은 가족건강성에 영향을 주는 변수였고, 그 중 사회적 낙인은 가족탄력성,

가족역량강화, 자아존중감 및 지역사회 통합에 유의한 영향을 미치는 변수였다.

본 연구결과에 의하면, 가족탄력성은 가족건강성을 직접 설명하는 유의한 변수였다. 이는 스트레스와 위기에 잘 견디면서 가족이 보다 긍정적인 방향으로 적응을 이룰 수 있는 가족의 자질이 조현병 환자 가족의 위기 대처에 효율적이었다는 선행연구결과와 일치하였고[12], 가족의 상호작용, 결속력, 지지체계와 자원 개입이나 향상이 가족의 기능을 강화시킬 수 있는 요인이 될 수 있다는 연구들을 뒷받침하고 있다[20-24]. 국내에서는 간호학은 물론 심리학이나 사회복지학 분야에서 만성질환이나 치매 노인 등 다양한 대상자에게 탄력성 프로그램 적용의 효과를 검증하였으며[12] 가족문제 해결에 효과적임을 확인할 수 있었다. 가족 중 정신질환자가 존재한다는 것은 돌봄 역할을 부여받은 가족의 개인적인 일상생활 및 경제적 어려움을 초래하고, 다른 만성질환자를 돌보는 가족들에 비해 높은 수준의 부담감과 스트레스를 가지게 된다[1,2]. 따라서 이러한 가족들의 탄력성 증진의 도모는 가족들의 정신적·정서적 안녕을 도모할 수 있으면서 조현병 환자의 간호 중 문제해결이나 대처능력에 영향을 미쳐 질병의 재발을 막고 건강 가족을 유지할 수 있는 기반이 될 수 있을 것이다.

자아존중감은 가족건강성을 직접 설명하는 유의한 변수였다. 자아존중감은 개인의 가치를 인정하고 타인의 존중을 인지하는 것으로서, 가족 전체라기보다는 개인의 속성을 반영한다. 하지만 가족구성원과의 관계에서 적용되고, 검증된 핵심적인 개념으로서 건강한 가족의 특성 중 가족원의 자아존중감이 높은 경우 가족원 간 유대감이 좋고, 대화가 잘 이루어지며, 문제를 잘 해결하고 공유하는 가치체계를 가진다고 하였다[13]. 이 결과는 장애아를 둔 가정의 가족건강성과 자아존중감과 상관성이 높게 나온 결과와 유사하였고[16], 자아존중감이 높을수록 가족건강성의 수준이 높은 것으로 나타난 선행결과[25]와 일치하였다. 또한 인간은 현재의 자신에 대한 인지의 긍정성이 높고 만족도가 높을 때 주변이나 외부적 상황도 긍정적으로 인식하고 만족도가 높아져 가족 삶의 질에 변화를 줄 수 있다는 결과[5,11,16]를 뒷받침해 주었다. 조현병을 가진 환자들의 가족은 사회적 낙인의 수준이 높으며, 이

로 인해 스트레스, 대인관계 회피, 사회생활의 결여 등이 나타날 수 있다[1,4,5,19]. 가족을 하나의 시스템으로 보고, 가족관계에 초점을 두는 가족건강성 관점과[6] 가족이란 상호 의존적이면서 가족원 간의 상호작용이 가족을 변화시켜 개인의 문제를 해결할 수 있다는 체계론적 관점[14]에서 본다면, 가족원 개개인의 자아존중감 향상은 건강한 정서와 긍정적 인식을 공유하면서 가족들과 건강하게 생활할 수 있게 하는 가족 전체의 밑거름이 될 수 있을 것이다.

지역사회통합은 가족건강성을 직접 설명하는 유의한 변수였다. 조현병 환자들은 2017년부터 조현병 환자의 인권이나 복지에 초점을 둔 정신건강증진 및 정신질환자 복지서비스 지원에 관한 법률이 시작되었지만, 지역사회 기반의 서비스가 충분하지 않아 환자를 돌보는 가족의 책임이 가중되었고, 가족들의 사생활이나 삶의 질을 떨어뜨려 가족의 부담을 증가시켜 가족 구성원 전체의 갈등과 긴장에도 부정적 영향을 주었다[26-28]. 이는 환자가 필요로 하는 기관과 전문가들과 소통하고 협조할 수 있는 서비스체계, 조현병 환자들을 위한 기관 및 지역사회 구성원들이 필요함을 내세운 결과[3,13]와 유사하였고, 지역사회의 지지, 가치 있는 자원에 대한 접근을 강조하면서, 사회적 지지자원의 활용이 가족 간의 갈등해결에 도움을 줄 수 있는 역할이 가능하게 한다는 결과[17]를 뒷받침하였다. 우리나라 현행법상 조현병 환자들은 통원치료에 중점을 두고 정신건강복지센터를 통한 관리를 통해 사회생활을 영위해 나가고 있다. 조현병 환자 가족들이 환자의 간호업무를 담당하며 감당해 나갈 경제적·정신적 부담은 국가나 사회가 공유하며 해결해야 할 과제이다. 가족과 사회와의 흐름과 소통이 원활하면서, 지역사회의 책임 있는 지원과 지지가 이루어질 때 조현병 환자의 치료나 재활에도 긍정적인 영향을 주게 되고, 지역사회 내 작은 단위의 가족의 건강을 확보할 수 있을 것이다.

사회적 낙인은 가족건강성을 간접적으로 설명하는 유의한 변수였다. 이러한 결과는 정신질환 가족들이 공통적으로 느끼는 스트레스와 죄책감이 가족들을 우울하게 만들고, 자아존중감을 침해할 수 있으며, 가족 기능에도 부정적 영향을 미칠 수 있음이 많은 결과에서 확인되었다[4,19,22,28-30]. 조현병 환자의 가족들은 타인들에게 가족

중 정신질환자가 있다는 사실을 감추고 싶어 하고, 환자와 함께 살아야 하는 현실에 적응하는데 어려움을 느낀다 [26,30]. 즉 환자나 가족들이 처한 현실이 스스로를 사회에서 격리시키고 위축되어, 낙인을 심화시킬 수 있는 위험이 잠재되어 있다. 따라서 조현병 환자 가족들의 자아존중감 향상과 회복력을 증진시킬 수 있는, 보다 현실적이고 적극적인 사회적 관심과 노력이 환자와 가족들을 다시 사회로 복귀시켜 소통할 수 있는 기회로 작용할 것이다.

가족은 가족원들이 긍정적 혹은 부정적인 방식으로 끊임없이 상호작용하는 주요 1차 집단으로, 이러한 작은 사회인 가정의 건강성은 가족 구성원의 전 생애를 통해 지속적으로 영향을 미칠 수 있다. 가족건강성은 가족의 강점, 건강한 정도를 의미하는 것으로 가족원 개인의 건강한 발달을 도모하고, 원만한 가족원 간의 상호작용을 통해 가치체계를 공유하고, 사회체계와도 원활한 교류를 하면서 생활하는 체계의 특성을 지닌다[6,7,13]. 따라서 이는 가족 미래의 긍정적 성장과 변화의 기초가 될 수 있다. 나아가 건강한 가정에서 성장한 사람이 안정적으로 자신을 돌보고 건강한 가족을 형성할 수 있는 가능성이 높으므로 조현병 환자들의 가족과 사회를 보다 건강하고 발전적으로 유지하기 위해서는 가족의 긍정적인 측면, 즉 건강성에 초점을 두고 이를 개발하는 것이 중요하다고 할 수 있다.

본 연구의 의의는 가족스트레스, 사회적 낙인, 가족탄력성, 가족역량강화, 자아존중감, 및 지역사회 통합은 가족건강성에 정적·부적인 영향을 미치는 변수라는 가설적 모형을 구축하였고, 그 결과, 경로의 추가 및 수정을 통해 예측할 수 있는 적합한 수정모형을 제시하였다. 무엇보다 다른 어떤 만성 질환들에 비해 환자간호에 대한 부담감, 질병 증상에 대한 두려움과 당황스러움 및 질병 과정의 불확실, 사회적 지원의 부족, 편견 등의 부담과 스트레스에 직면한 조현병 환자 가족들의 가족건강성의 요인을 사회적 현상이나 방향이 아닌 가족의 관계성과 관련된 요인을 탐구하고 예측할 수 있는 모형을 구축하는 데 연구의 의의가 있었다.

본 연구의 제한점과 결과를 근거로 다음과 같이 제언하고자 한다. 첫째, 본 연구에서 시도한 가족건강성에 영향을 미치는 변수를 기반으로 모형을 좀 더 구체화할 수 있는 반

복적 접근이 필요하다. 둘째, 연구의 대상이 일부 지역으로 제한되어 있으므로, 추후에는 조현병 환자들을 위한 지역적 재정 상태나 환경을 감안하여 현실을 비교할 수 있는 연구가 요구된다. 셋째, 본 연구 결과에서 영향이 있다고 확인된 변수들을 바탕으로 조현병을 비롯한 다른 정신질환자들 및 그들을 돌보는 가족들을 위한 사회적 제도의 안착이 시급하다. 넷째, 사회적 인식이나 편견을 극복하고 환자들을 비롯한 구성원들의 가족건강성 향상을 도모할 수 있는 가족간호 프로그램의 개발과 효과를 검증하는 연구를 제안한다.

결론

본 연구는 조현병 환자 가족들의 가족건강성에 미치는 요인을 파악하고, 이러한 요인들이 가족건강성에 직·간접적으로 영향을 미치는 경로를 검증 및 분석하고자 시도된 구조모형 연구이다. 본 연구에서 사회적 낙인, 가족탄력성, 자아존중감, 및 지역사회통합은 가족건강성에 영향을 주는 변수였고, 그 중 사회적 낙인은 가족탄력성, 가족역량강화, 자아존중감, 및 지역사회 통합에 유의한 영향을 미치는 변수였다. 이상의 결과를 볼 때, 조현병 환자들 가족 구성원들의 심리적 안정감을 주고 내외적 지지체계를 강화하기 위한 중재는 가족건강성을 지향할 수 있는 효과적 대안이 될 수 있을 것이다. 특히, 사회구성원들에게 거절당하고, 외면당할 수 있는 정신질환자들 가족의 강점을 더욱 강화하기 위한 방안을 위한 지속적인 관심이 절실하다. 정신질환은 특정인들에게만 발병하는 질병이 아니고, 누구나 경험할 수 있고 가족들에게 이환될 수 있음을 인식할 필요가 있다. 따라서 환자와 가족들이 함께 할 수 있는 교육과 중재를 제공함으로써 가족들 간의 유대를 더욱 긴밀히 하고, 사회의 차가운 시선들과 편견을 해결할 수 있는 좀 더 적극적이고 현실적인 가족 단위의 중재를 고안할 수 있어야 할 것이다.

CONFLICTS OF INTEREST

The authors declared no conflicts of interest.

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Developing a Prediction Model for Family Health in Families of Patients with Schizophrenia

Han, Kuem Sun¹ · Hong, Yeong Seon² · Kang, Hyuncheol³

Roh, Youn Hee⁴ · Choi, Myung Sook⁵ · Moon, Hee Jin⁶

¹*Professor, College of Nursing, Korea University, Seoul*

²*Assistant Professor, Department of Nursing, Baekseok Culture University, Cheonan*

³*Professor, Division of Big Data and Management Engineering, Hoseo University, Asan*

⁴*Associate Professor, Department of Nursing, Kyungbok University, Namyangju*

⁵*Professor, Department of Nursing, Seoil University, Seoul*

⁶*Nurse, Myongji Hospital, Goyang, Korea*

Purpose: The purpose of this study was to identify factors related to family health and develop a prediction model with an ability to explain family health in families of patients with schizophrenia. **Methods:** A hypothesized model with twelve pathway forms was developed based on literature review. Family stress and social stigma were included as two exogenous variables; whereas family resilience, family empowerment, self-esteem, community integration, and family health were included as endogenous variables. Data were collected using a self-report questionnaire from 206 families of patients with schizophrenia living in Republic of Korea. Data were analyzed with PASW/WIN 18.0 and AMOS 18.0 programs. **Results:** Social stigma had a negatively indirect and total effect on family health. Family resilience, self-esteem, and community integration had positive and direct and overall effects on family health. **Conclusion:** A prediction model for families of patients with schizophrenia is proposed and social stigma, family resilience, self-esteem, and community integration are presented as predicting factors for family health. Nursing interventions and support programs should be developed to overcome social stigma and improve family resilience, self-esteem, and community integration are proposed.

Key Words: Schizophrenia; Family health; Social stigma

* Address reprint requests to : Hong, Yeong Seon

Department of Nursing, Baekseok Culture University, 58, Munam-ro, Dongnam-gu, Cheonan 31065, Korea.

Tel: +82-41-550-2325, Fax: +82-41-550-2314, E-mail: youngsunny92@daum.net

Linalyl acetate prevents three related factors of vascular damage in COPD-like and hypertensive rats

Yu Shan Hsieh¹, You Kyoung Shin¹, A Young Han¹, Soonho Kwon, and Geun Hee Seol*

Introduction

Comorbidities are frequent in chronic obstructive pulmonary disease (COPD) patients [1, 2], and are also related to decreased quality of life and increased mortality [3]. Cardiovascular disease is the second-highest cause of death in patients with COPD after respiratory problems [4]. One of the risk factors for cardiovascular diseases, hypertension, is the most common comorbidity in COPD [2, 5], and its prevalence in COPD patients is higher than that in non-COPD subjects [6]. However, the need to simultaneously prevent COPD and comorbidities is in clinical settings [3].

Vascular damage is an important factor in the development of hypertension [7, 8] and COPD [9, 10]. Studies have shown that vascular endothelial dysfunction, which also induces vascular damage, is related to the comorbidities of cardiovascular risk, hypertension [11], and COPD [2, 5]. Specifically, an increased incidence of hypertension and elevated

cardiovascular mortality are now considered degenerative risk factors for COPD [12]. Thus, early detection or prevention of vascular damage is an effective strategy for managing both diseases [10, 13, 14]. By more accurately establishing disease related factors, it should be possible to implement more efficient preventive strategies in clinical settings.

However, mechanistic links between vascular damage in COPD and hypertension remain to be elucidated. Chronic inflammation [15], oxidative stress [9] and vascular endothelial dysfunction are known hypertension-inducing factors [16] that are associated with COPD and could be instigators of the vascular damage observed in patients with COPD and hypertension [17]. However, disrupted vascular function in this population has received limited research attention. And to date, no studies have sought to identify the related factors of vascular damage in COPD with hypertension, highlighting the importance of understanding the primary mechanistic

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* Corresponding author: Geun Hee Seol
E-mail: ghseol@korea.ac.kr

links among chronic inflammation, oxidative stress, and endothelial dysfunction in preventing the development of elevated incidence and mortality in this population.

Various animal models that take into account the causes of COPD have been developed [18], but there are few animal models of COPD that incorporate comorbidities such as systemic hypertension. Therefore, clarifying the pathophysiological characteristics and related factors of vascular damage in COPD with hypertension and comorbidities requires the development of an appropriate animal model. The purpose of this study is to clarify the pathophysiological characteristics and related factors of vascular damage in COPD-like and hypertensive rats by evaluating hemodynamic factors and related molecular factors.

Linalyl acetate (LA), a natural component of the essential oil of *Citrus bergamia* Risso, *Lavandula angustifolia* and *Salvia sclarea*, has been reported to decrease systolic blood pressure (SBP) in hypertensive rats [20] and prevent ischemic injury by reducing oxidative stress induced vascular damage in the aorta of hypertensive rats [20]. LA has also been shown to have anti-inflammatory effects, protecting against vascular endothelial dysfunction in a rat model of inflammation [21] and blocking cardiovascular disease induced endothelial dysfunction by modulating intracellular calcium in endothelial cells [22]. Moreover, LA was reported to decrease inflammatory nuclear factor kappa B (NF- κ B) expression in diabetic rats [23]. Despite previous reports of anti-inflammatory and/or anti-hypertensive effects of LA in various animal models, no studies have investigated the possible preventive effects of LA in COPD with hypertension. Accordingly, we here tested the

hypothesis that LA mitigates vascular damage in COPD-like and hypertensive rats.

Materials and Methods

2.1. Experimental animals.

Male Sprague-Dawley rats (4 weeks old) were obtained from Samtaco (Osan, Korea) and housed in the laboratory environment for a week. The experimental procedures were conducted in accordance with guidelines relevant to the care of experimental animals, as approved by the Korea University Animal Experiment Ethics Committee (KUIACUC-2016-153). After randomized, rats were assigned to 7 groups: normotensive controls (Control); C COPD-like and hypertensive rats treated with vehicle (Vehicle), 1 mg/kg LA (LA 1), 10 mg/kg LA (LA 10), or 100 mg/kg LA (LA 100); and COPD-like and hypertensive rats treated 2.5 mg/kg dexamethasone (Dexa) or 10 mg/kg nifedipine, used as positive controls.

2.2. COPD-like and hypertensive rats

COPD-like characteristics and hypertension were simultaneously induced by intranasal administration of porcine pancreatic elastase (PPE) and lipopolysaccharide (LPS) [24], with chronic exposure to nicotine and immobilization stress, as previously described [19]. LA, nifedipine, and dexamethasone were intraperitoneally administered 2 hours before intranasal administration of PPE 15 units and LPS 87.5 μ g. Dexamethasone is well known as the effect of anti-inflammation on COPD treatment in clinical settings [25], and nifedipine has not only antioxidant effect but also antihypertensive effect. Therefore, dexamethasone and nifedipine were used as positive

control. Blood and tissue samples were taken under anesthesia after blood pressure measurements were completed. The specific protocol is illustrated in Supplementary Figure 1.

2.3. Histopathological analysis of lung tissue.

Inflammatory responses in lung tissue were investigated using histopathological analyses. Lung tissues were fixed in 10% paraformaldehyde and embedded in paraffin, after which paraffin blocks were cut into 4- μ m-thick sections. Sections were stained with hematoxylin and eosin (H&E) and then imaged at 200X magnification using a Nikon DS-Ri2 fluorescence microscope (Nikon, Japan). The alveolar diameter of each airspace was calculated using NIS Elements imaging software (Nikon, Japan).

2.4. Western blotting.

The lung tissue was homogenized and lysed using a Protein Extraction Kit (iNtRON, Korea). Proteins in samples (20 μ g/lane) were resolved by SDS-PAGE on 10% gels, then transferred to nitrocellulose membranes. Membranes were probed by first incubating overnight at 4°C with rabbit polyclonal anti-NF- κ B primary antibody (Santa Cruz, USA), then incubated with the anti-rabbit IgG HRP-linked secondary antibody for 1 hour at room temperature. Signals were visualized using an ECL Plus Western blot detection kit (Bio-Rad, USA), and analyzed densitometrically using Image J software (National Institutes of Health, USA).

2.5. Preparation of bronchoalveolar lavage (BAL) fluid.

BAL fluid was collected from anesthetized rats by delivering 2 ml of 0.9% saline via the trachea using a 22-gauge catheter. After centrifuging samples

at 500 \times g for 10 minutes, supernatants were collected and transferred to fresh tubes for experimental preparation.

2.6. Enzyme-linked immunosorbent assay (ELISA).

Concentrations of cytokine tumor necrosis factor (TNF)- α and interleukin (IL)-6, in BAL fluid were measured using rat TNF- α and IL-6 ELISA kits (Pepro Tech, London, UK). Results were obtained by measuring absorbance at 450 nm using a microplate ELISA reader (BMG Labtech, Germany), according to the manufacturer's instructions.

2.7. Zymographic analysis.

Matrix metalloproteinase (MMP-9) protein was measured by zymography using sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) on 8% gels containing 1 mg/ml gelatin (Sigma-Aldrich, USA). After electrophoresis, gels were renatured with 2.5% Triton X-100 for 1 hour, then incubated for 20 hours in 50 mM Tris-Cl buffer (pH 7.4) containing 10 mM CaCl₂ and 0.02% NaN₃. Gels were stained for 2 hours with 0.5% Coomassie Brilliant Blue (Sigma-Aldrich, USA) in 7.5% acetic acid and 10% isopropyl alcohol, followed by destaining to visualize MMP-9 bands. Relative densities were analyzed using Image J software (National Institutes of Health, USA).

2.8. Measurement of blood pressure.

Blood pressure was measured 30 minutes after intraperitoneal administration of test agents, at 1-week intervals thereafter, and at the end of the experiment, using a CODA-6 non-invasive tail cuff system (Kent Scientific, Torrington, CT, USA).

2.9. Nitrite assay.

Blood was collected from the abdominal aorta and incubated at room temperature for 2 hours, followed by centrifugation at 1900' g for 20 minutes to obtain serum. The level of nitrite was measured by adding 100 µl Griess reagent (0.1% naphthylethylenediamide and 1% sulfanilamide) (Sigma-Aldrich, USA) each to 50-µl serum sample, and then incubated for 10 minutes at room temperature. The level of nitrite accumulated in serum was determined by measuring absorbance at 540 nm using a microplate ELISA reader (BMG Labtech, Germany).

2.10. 2,2-Diphenyl-1-picrylhydrazyl (DPPH) assay.

Serum was incubated with DPPH (23.6 µg/ml in ethanol) for 30 minutes at 37°C in the presence of different concentrations of LA or ascorbic acid (positive control). Absorbance was measured at 517 nm using an ELISA microplate reader (BMG Labtech, Germany). Total antioxidant capacity was expressed as the percentage of maximum inhibition obtained with ascorbic acid.

2.11. Malondialdehyde (MDA) assay.

A 0.5-ml serum sample was mixed with 1 ml of a solution of 0.37% (w/v) thiobarbituric acid and 15% w/v trichloroacetic acid in 0.25 M HCl. Samples were placed in boiling water for 15 minutes, then centrifuged at 1,000 ' g for 10 minutes. Absorbance was measured at a wavelength of 535 nm at room temperature using an ELISA microplate reader (BMG Labtech, Germany).

2.12. Lactate dehydrogenase (LDH) activity.

Lactate dehydrogenase enzymatic activity, used

as a marker of cytotoxicity, was determined with a CytoTox 96 Non-Radioactive Cytotoxicity Assay kit (Promega Co., USA) according to the manufacturer's instructions. Changes in absorbance at 340 nm were measured using an ELISA microplate reader (BMG Labtech, Germany).

2.13. Solutions and chemicals.

LA, nifedipine, dexamethasone, polyethylene glycol (PEG) 200, LPS, nicotine, were obtained from Sigma-Aldrich Co. (Saint Louis, Missouri, USA). PPE was purchased from Elastin Products Co. (Owensville, Missouri, USA). LA, nifedipine, and dexamethasone were dissolved in PEG 200, whereas PPE and LPS were dissolved in phosphate-buffered saline.

2.14. Statistical analysis.

Results are presented as means \pm standard error of the mean (SEM). Blood pressure was analyzed by repeated measures one-way analysis of variance (ANOVA), and other variables were compared by one-way ANOVA followed by an LSD post hoc test using SPSS Statistics 22 version (IBM, USA). A *P*-value less than 0.05 was considered statistically significant.

Results

3.1. LA prevents inflammatory responses in COPD-like and hypertensive rats.

Histopathological analyses revealed emphysematous destruction in lung tissue from vehicle group compared with the untreated normotensive control group (Fig. 1A). This lung damage was prevented by the highest dose of LA (100 mg/kg), which maintained the lung structure similar to that of

the control group. In addition, alveolar diameter was enlarged in the vehicle group; this effect was also prevented by treatment with 100 mg/kg LA (Fig. 1B), which restored alveolar diameter to the normal range. NF- κ B expression abnormally increased in lung tissue of vehicle group, which was restored to normal level in the LA 100 group (Fig. 1C).

TNF- α tended to increase in vehicle group compared to control group, although there was no significant difference. The levels of the pro-inflammatory cytokine IL-6, and the degradative enzyme MMP-9 in BAL fluid was significantly elevated in the vehicle group compared with the control group ($p < 0.001$, respectively). Both LA and dexamethasone showed anti-inflammatory effects, which were greater in the LA 100 group for IL-6 and MMP-9 compared with the vehicle group (Fig. 2B - C). These results showed that treatment with LA may prevent increase in IL-6 and MMP-9 in COPD-like and hypertensive rats.

3.2. LA prevents the increase in SBP, serum lipid peroxidation, and vascular cytotoxicity in COPD-like and hypertensive rats .

Two-way ANOVA was used to analyze differences in blood pressure over time, with the level of significance of time and group interactions illustrated in Figure 3A. SBP continuously increased up to day 22 in COPD-like and hypertensive rats treated with vehicle and was then maintained at this elevated level until the end of the experiment (Fig. 3A). SBP was significantly elevated over time in the vehicle group compared with the normotensive control group. The elevation in SBP in the vehicle group was attenuated by treatment with LA or nifedipine, such that SBP was significantly lower over time in the LA

10 group, LA 100 group, and nifedipine group compared with the vehicle group. A plot of blood pressure over time showed that hypertension was maintained in the vehicle group until the end of the experiment, whereas increases in blood pressure were inhibited in the LA and nifedipine groups. These results indicate that LA exerts an antihypertensive effect by preventing the elevation in SBP in COPD-like and hypertensive rats .

Serum levels of MDA and LDH were significantly elevated in the vehicle group compared with the control group. For both indices, LA 100 group exerted a significant reversely effect (Fig. 3B, C). Also, serum levels of LDH was significantly reduced in the LA 1 and LA 10 group compared with the vehicle group. These results indicate that LA may prevent vascular damage in COPD-like and hypertensive rats by blocking lipid peroxidation and cytotoxicity, the latter indicated by LDH levels. These three factors were considered that have relationship with inflammation and vascular function simultaneously. Thus, the dexamethasone and nifedipine were presented as a common positive control.

3.3. Serum nitrite levels and total antioxidant capacity in COPD-like and hypertensive rats .

Serum nitrite levels were significantly lower in vehicle group. Although LA did not significantly affect serum nitrite level, LA showed a tendency to normalize serum nitrite compared with the vehicle group (Fig. 4A). Serum DPPH levels, a total antioxidant capacity, was decreased in the vehicle group compared with the control group (Fig. 4B). However, LA did not significantly affect total antioxidant capacity in serum.

Discussion

Considering factors that combine chronic inflammatory and systemic hypertensive features, we reviewed the available literature about COPD and hypertension to identify the foremost and common related factors of vascular damage in our study, other animal models of COPD or hypertension, and clinical research. Our findings presented in Figure 5 indicate that COPD-like and hypertensive rats in the current study reflects the pathophysiological characteristics of COPD patients who suffer from hypertension. Increases in the pro-inflammatory cytokines TNF- α [26, 27] and IL-6 [27, 28], the degradative enzyme MMP-9 [29, 30] and the inflammation-related gene NF-kB [27, 31], as well as enlarged alveoli are commonly observed in COPD patients and rat models [32, 33]. In addition, decreases in serum nitrite and serum total antioxidant capacity are associated with altered vascular tone in hypertensive rats [34, 35] and patients with hypertension [36, 37] and coronary heart disease [38] in a clinical setting. An important concurrent finding in our rat model was the significant elevation in SBP, serum MDA and serum LDH, which are similar to observations in patients with COPD [39, 40] and hypertension [41, 42].

Here, we assessed the potential of the three major related factors of COPD with hypertension—elevated SBP, elevated serum MDA and elevated serum LDH—as predictive biomarkers and therapeutic targets of vascular damage. An elevation in SBP makes a major contribution to increases in systemic inflammation and vascular damage [43]. Previous studies have also reported that SBP is increased in hypertensive rats [19, 20, 35], a finding that is associated with elevated levels of lipid peroxidation

[34, 44, 45]. Such increases in SBP and lipid peroxidation have been shown to affect mortality and morbidity in patients with COPD [46, 47].

Among the various processes involved in hypertension, vascular damage due to oxidative stress is particularly important in patients with hypertension, atherosclerosis, or stroke [48]. Under oxidative stress conditions, reactive oxygen species attack lipids, resulting in lipid peroxidation. Increased serum MDA has been identified in situations in which lipid peroxidation induces atherosclerosis or inflammatory vascular damage. This phenomenon has also been reported in COPD mouse models [49, 50], hypertensive rat models [19, 35, 51] and patients [41].

Likewise, LDH is a well-known pathologic marker in pulmonary hypertension [52] and cardiac dysfunction [53]. LDH is a cytoplasmic enzyme in all cells of the body that catalyzes the reversible conversion of pyruvate to lactate as a part of the lactic acid cycle [54]. Following cellular injury, LDH is released from damaged cells into serum [55]. Serum LDH is also elevated in patients with COPD [40], hypertensive rats [56], and atherosclerotic mice [57].

The results of the present study on COPD-like and hypertensive rats confirm literature reports that increases in SBP and serum MDA and LDH levels are major collaborative factors of both COPD [39, 40, 58] and hypertension [41, 42, 59]. Thus, our findings suggest that these three related factors have potential predictive and preventive value in patients who suffer from COPD with hypertension.

In the present study, only dexamethasone was used as a positive control for the measurement of inflammatory factors (TNF- α , IL-6, MMP-9). However, nifedipine has antihypertensive as well as

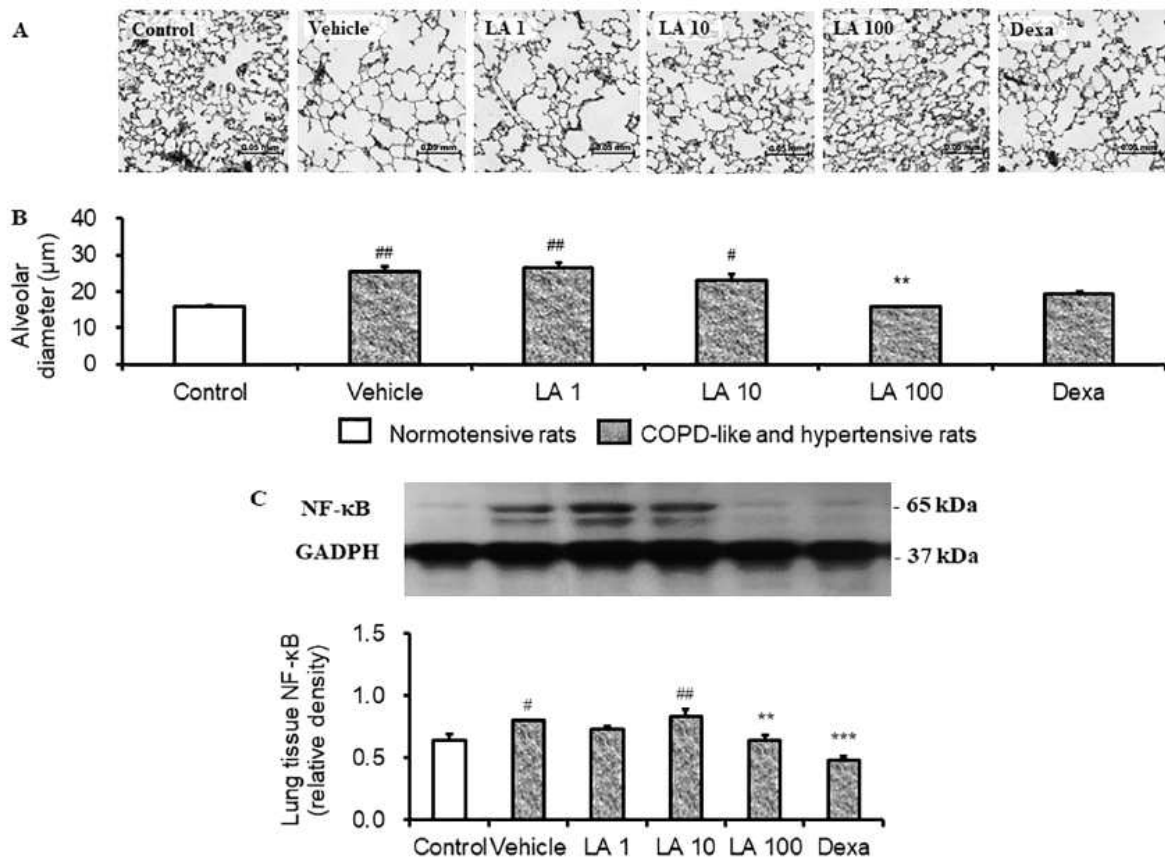


Fig. 1. Linalyl acetate (LA) prevents inflammatory responses in lung tissue in the chronic obstructive pulmonary disease (COPD)-like and hypertensive rats. (A) Histopathological analysis of lung sections by hematoxylin and eosin staining. Scale bars: 50 μm . (B) Lung injury was quantified as mean alveolar diameter in a field of view ($n = 2-4/\text{group}$). (C) Western blot analysis of nuclear factor kappa B (NF- κ B) in lung tissue showed as full-length ($n = 3-6/\text{group}$). Data are presented as means \pm SEM. [#] $p < 0.05$, ^{##} $p < 0.01$ vs. the control group; ^{**} $p < 0.01$, ^{***} $p < 0.001$ vs. the vehicle group.

vascular damage. This phenomenon has also been reported in COPD mouse models [49,50], hypertensive rat models [19,35,51] and patients [41].

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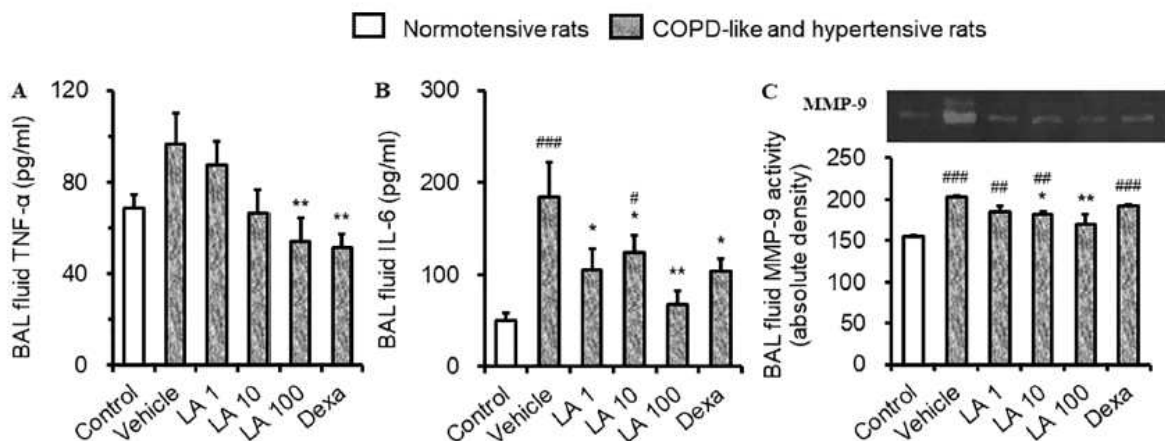


Fig. 2. Linalyl acetate (LA) suppresses the level of pro-inflammatory cytokines and degradative enzymes in bronchoalveolar lavage (BAL) fluid in the chronic obstructive pulmonary disease (COPD)-like and hypertensive rats. (A) Quantification of tumor necrosis factor (TNF)- α and (B) interleukin (IL)-6 in BAL fluid samples by enzyme-linked immunosorbent assay ($n = 3-4/\text{group}$). (C) Zymographic analysis of matrix metalloproteinase (MMP)-9, measured in the same samples showed as full-length gel ($n = 3-5/\text{group}$). Data are presented as means \pm SEM. [#] $p < 0.05$, ^{##} $p < 0.01$, ^{###} $p < 0.001$ vs. the control group; ^{*} $p < 0.05$, ^{**} $p < 0.01$ vs. the vehicle group.

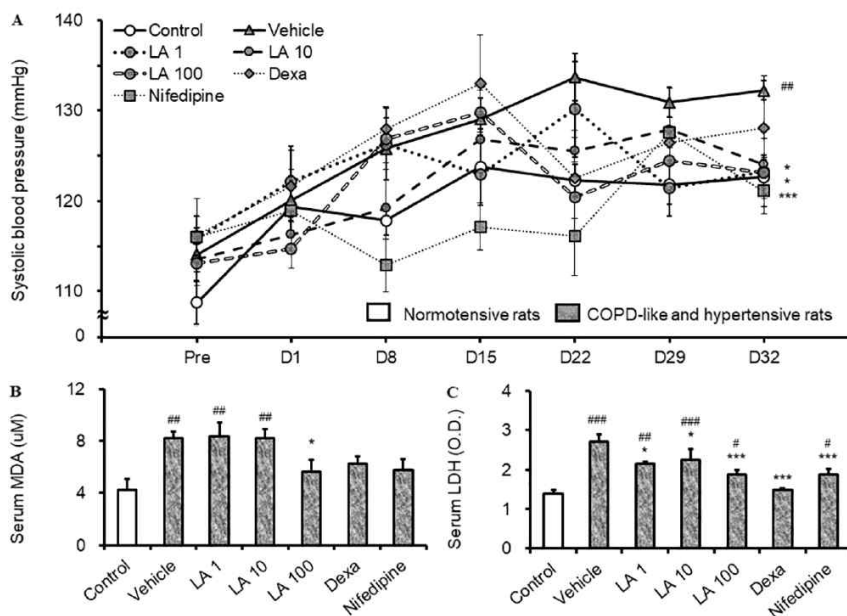


Fig. 3. Linalyl acetate (LA) prevents increases in systolic blood pressure (SBP), serum lipid peroxidation, and vascular cytotoxicity in the chronic obstructive pulmonary disease (COPD)-like and hypertensive rats. (A) SBP was measured before the experiment and at days 1, 8, 15, 22, 29, and 32. Result analyzed by repeated measures one-way analysis of variance (ANOVA) ($n = 6-9/\text{group}$). (B) Malondialdehyde (MDA) ($n = 3-7/\text{group}$) and (C) lactate dehydrogenase (LDH) levels ($n = 4-7/\text{group}$) were measured in serum. Data are presented as means \pm SEM. ## $p < 0.01$ vs. the control group; * $p < 0.05$, *** $p < 0.001$ vs. the vehicle group.

anti-inflammatory [60] and antioxidant [61] effects. Although we could not to exclude the possibility that the effect of nifedipine was caused by its anti-inflammatory and antioxidant properties as well as its reduction in blood pressure, our findings suggest that LA may have preventive value in COPD with hypertension. Importantly, we demonstrated that LA prevents the manifestation of these three related factors by preventing inflammatory and hypertensive effects, and further exhibits preventive potential by

decreasing serum nitrite levels and total antioxidant capacity in COPD-like and hypertensive rats. In previous research, the LA-rich essential oil *Salvia sclarea* was reported to exert a preventive effect on endothelial dysfunction by increasing serum nitrite production in a rat model with immobilization stress-induced hypertension [62]. However, *Citrus bergamia* Risso was demonstrated to exert a protective effect against vascular disorders by regulating the vascular tone of smooth muscle [63],

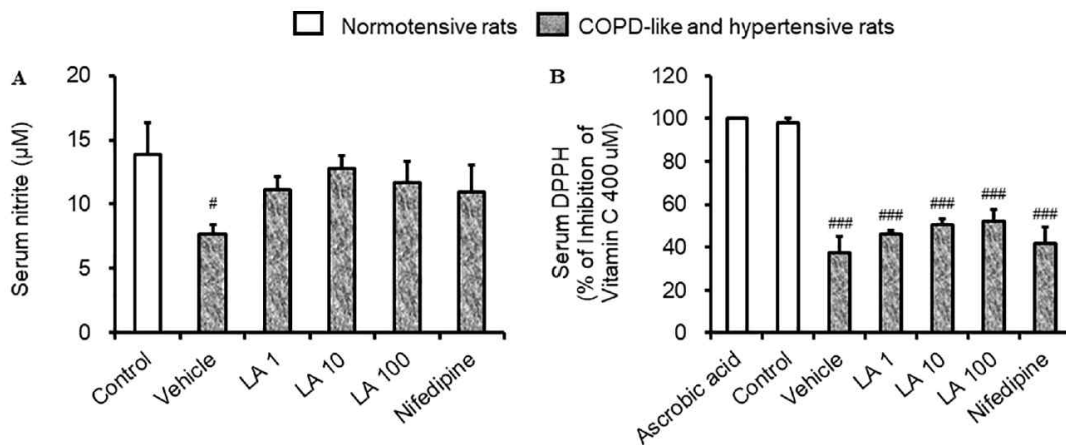


Fig. 4. LA potentially increases serum nitrite levels and total antioxidant capacity in the chronic obstructive pulmonary disease (COPD)-like and hypertensive rats. The levels of (A) nitrite and (B) 2,2-Diphenyl-1-picrylhydrazyl (DPPH) ($n = 3-8/\text{group}$) were measured in serum. Data are presented as means \pm SEM ($n = 3-5/\text{group}$). # $p < 0.05$, ### $p < 0.001$ vs. the control group.]

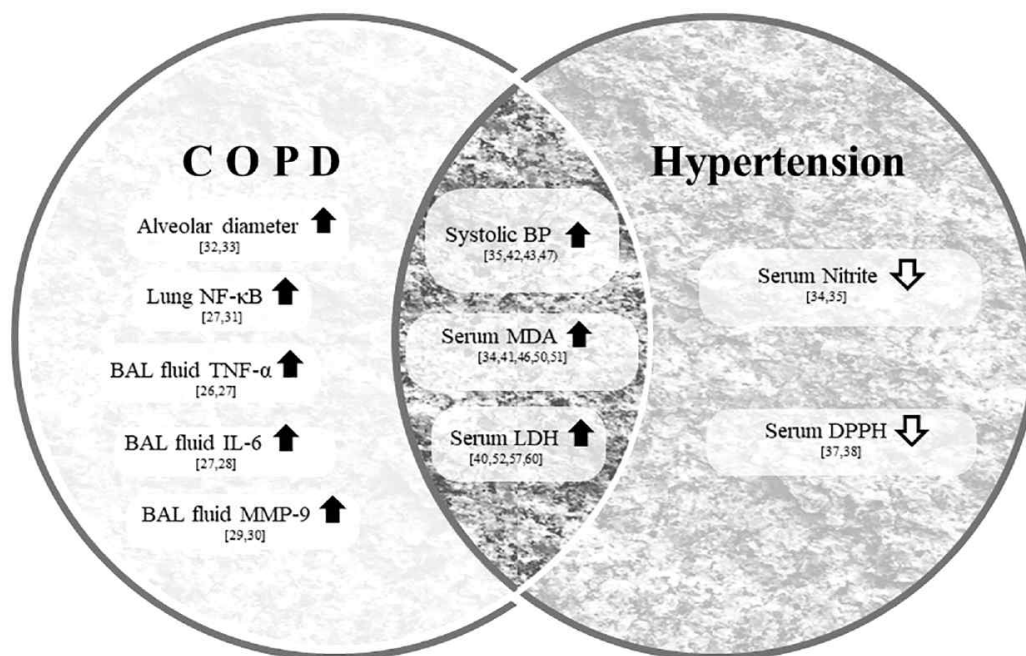


Fig. 5. Venn diagram comparing factors of chronic obstructive pulmonary disease (COPD) (light gray) and hypertension (dark gray), based on published reports. The three main related factors observed in the rat model of COPD with hypertension are indicated in the overlapping regions.

indicating that LA effects may not be mediated exclusively through the NO/cGMP pathway. Although details of the molecular mechanisms underlying the protective effect of LA against vascular damage will require further investigation, this study supports the potential of LA to prevent vascular damage in COPD with hypertension.

Collectively, our results provide novel insight into the action of LA in preventing vascular damage and suggest the potential of LA treatment as a new strategy for preventing vascular damage in COPD with hypertension. In situations where COPD and hypertension occur simultaneously, early detection of these three related factors highlighted here might predict subsequent vascular damage. Notable in this context, LA showed early preventive effects against vascular damage. This study also could provide a descriptive basis for further research on COPD with hypertension that might produce future benefits for patients in a clinical setting.

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CONFLICTS OF INTEREST

The authors declare no competing financial interests.

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Linalyl acetate prevents three related factors of vascular damage in COPD-like and hypertensive rats

Yu Shan Hsieh¹, You Kyoung Shin¹, A Young Han¹, Soonho Kwon, and Geun Hee Seol*

Department of Basic Nursing Science, College of Nursing, Korea University, Seoul 02841, Republic of Korea

Abstract

Preventing vascular damage is considered an effective strategy in patients who suffer from chronic obstructive pulmonary disease (COPD) with hypertension. Here, we investigated vascular damage in COPD-like and hypertensive rats, which demonstrated the presence of the three related factors of COPD with hypertension. These include elevated systolic blood pressure (SBP), serum malondialdehyde (MDA) and serum lactate dehydrogenase (LDH), which are positively correlated with vascular damage in patients. In addition to increases in these three related factors, COPD-like and hypertensive rats exhibited increased levels of pro-inflammatory mediators, such as tumor necrosis factor- α , interleukin-6, and matrix metalloproteinase-9 in bronchoalveolar lavage fluid, and enlargement of alveolar airspaces, recapitulating clinical findings in previous studies of patients. Moreover, the appearance of these related factors was prevented by linalyl acetate. Our results provide novel insight into the potential of LA to prevent vascular damage and elevated SBP, serum MDA and serum LDH in COPD with hypertension, and could lead to an alternative strategy for preventing vascular damage for patients suffered from COPD with hypertension in a clinical setting.

Key Words: linalyl acetate; COPD; hypertension; comorbidity; vascular damage

* Address reprint requests to : G.H.Seol

Department of Basic Nursing Science, College of Nursing, Korea University, 145 Anam-ro, Seongbuk-gu, Seoul 02841, Republic of Korea.

E-mail: ghseol@korea.ac.kr

Development and psychometric validation of the Menstrual Health Instrument (MHI) for adolescents in Korea

Hyunjeong Shin¹ · Young-Joo Park² · Inhae Cho³

Adolescent health is important for normal transition from childhood to adulthood (Djalalinia, Tehrani, Afzali, & Hejazi, 2012). Menstruation is one of the most prominent physical changes during adolescence, which marks the beginning of womanhood and the potential for reproduction (Nur Azurah, Sanci, Moore, & Grover, 2013). Although menstruation is a natural biological process, it often leads to physical and psychological problems in adolescent girls (Parker, Sneddon, & Arbon, 2009). Many teenagers experience physical pain and discomfort as well as psychological symptoms such as irritability or depression premenstrually and during menstruation (Parker et al., 2009; Strine, Chapman, & Ahluwalia, 2005). Menstruation-related problems contribute to their school absenteeism and disturbances in daily life experiences during this sensitive phase of development (Agarwal & Venkat, 2009). Prior studies with Korean adolescents have also reported that 78—87% of adolescent girls experience menstrual pain and discomfort, and 18—25% of the girls experience disturbances in their daily

activities due to menstrual symptoms (Jeon, Cha, & Sok, 2014; Jeon & Whang, 2014; Kim, Lim, Woo, & Kim, 2008). This suggests that proper screening and assessment of menstrual health are required in the adolescent group and it has important international implications for adolescents across the globe.

Assessment of menstrual health is also important because it reflects and affects general health status (Barnard, Frayne, Skinner, & Sullivan, 2003; Farquhar, Roberts, Okonkwo, & Stewart, 2009). Barnard et al. (2003) reported that women who have one or more menstrual symptoms showed significantly lower health status. Various medical and mental health conditions such as epilepsy, migraine, eating disorders, and bipolar disorder can be affected by the menstrual cycle (Pinkerton, Guico-Pabia, & Taylor, 2010). Conversely, menstrual health can be affected by other possible medical problems such as poorly controlled diabetes mellitus, thyroid dysfunction, or anorexia (American Academy of Pediatrics & American College

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* Corresponding author: Inhae Cho
E-mail: inhae05@gmail.com

of Obstetricians and Gynecologists, 2006). Strotmeyer et al. (2003) reported that women under 20 years with type 1 diabetes had more menstrual problems than those without diabetes. Nevertheless, health care providers might underestimate the clinical significance of menstrual health and have poorly studied it in adolescent girls (Barnard et al., 2003; Farquhar et al., 2009).

In addition, few clinical studies of menstrual health in adolescents have focused on the duration or other cycle characteristics unless girls are dysmenorrheic or amenorrheic (Morrison, Larkspur, Calibuso, & Brown, 2010). Boisseau (2016) mentioned that assessment of menstrual cycles and function can be a starting point for discussion of eating disorders. Although the menstrual cycle is often irregular through adolescence, it is considered a vital sign which reflects reproductive and overall health (American Academy of Pediatrics & American College of Obstetricians and Gynecologists, 2006; Nelson, 2010).

Menstruation, the experience of the biological event, is also a part of sociocultural experience for women in their life (Chiou, Wang, Hsu, & Liu, 2013; Mansfield & Stubbs, 2007). It is experienced differently by every girl depending on her own psychological development and experience and her particular social and cultural attitudes or beliefs (Mansfield & Stubbs, 2007). Adolescents that have negative attitudes and beliefs about their menstruation have shown higher morbidity associated with menstruation (Houston, Abraham, Huang, & D'Angelo, 2006). Thus, assessing perceptions and attitudes towards menstruation and the implications of menstrual symptoms on physical and emotional well-being is fundamental to screening and evaluation

of menstrual health (Wong & Khoo, 2011).

However, existing tools do not account for a broad range of menstrual health and experiences (McPherson & Korfine, 2004). The conceptualization of menstruation and the assessment standards used to evaluate menstrual health by health care providers are generally based on biomedically oriented research using clinical samples (Wood, Koch, & Mansfield, 2007). It is most often treated from a pathological point of view of premenstrual syndrome in the existing medical and psychological literature (McPherson & Korfine, 2004; Negriff, Dorn, Hillman, & Huang, 2009). There is a great need to establish and test more holistic and integrative measures for assessing current menstrual health and experiences (McPherson & Korfine, 2004; Wood et al., 2007).

The aim of the researchers was to develop a valid measure of menstrual health in adolescents to provide a broader and more holistic measure of menstrual health beyond clinical dysmenorrheic or premenstrual symptoms. In this paper, we described the process of item pool development and field testing to evaluate validity and reliability and finalize the scale.

Purpose

The aims of the researchers were to develop the Menstrual Health Instrument (MHI) for adolescents and test its initial psychometric properties.

Instrument Development

This study consisted of four phases: defining the construct of the instrument, item generation, evaluation of content and face validity, and psychometric testing. The process of the MHI development is presented in Figure 1.

Phase 1: Defining the construct of the instrument

Methods. The methods for item

construction were guided by the principles outlined in Streiner and Norman (2008) and DeVellis (2012). To define the construct of the instrument, an extensive literature review was conducted. For the topics ‘menstruation in adolescents’ and ‘menstrual health’, CINAHL and MEDLINE databases, Korean nursing journals, unpublished master’s theses and doctoral dissertations in Korea, and current menstruation-related measures for adolescents were searched from 1997 onward. An initial literature search yielded 304 papers, of which 174 that were neither available as full-texts nor helpful to clarify the construct of menstrual health in adolescents (e.g., studies for children or adult women, studies on menarche and menstrual preparation, menstrual migraine, menstrual taboo, menstrual suppression etc.) and 68 duplicates were excluded. Thus, 62 papers (41 English, 21 Korean-12 published, 9 unpublished theses or dissertations) that were fully relevant were reviewed.

Results. The review was performed to provide an understanding of menstrual health in adolescents and delineate the essential elements of it. The focus was on a broader and more holistic measure of menstrual health beyond clinical menstrual pain. The identification of conceptual constructs clarified the elements that need to be assessed for measuring menstrual health reflected in following four components: (1) menstrual cycle characteristics, (2) symptoms and their impacts on daily activities, (3) self-care managing behaviors, and (4) attitudes and perceptions on menstruation.

‘Menstrual cycle characteristics’ involve the assessment of cycle length and regularity, patterns of bleeding, and length of period. Many researchers attempted to measure menstrual intervals, duration of

menstrual bleeding, and quantity of blood loss, and categorized them as either “normal” or “abnormal” based on medical standards (Adams Hillard, 2014; Agarwal & Venkat, 2009; Czajkowska, Drosdzol-Cop, Galazka, Naworska, & Skrzypulec-Plinta, 2015; Greydanus, Omar, Tsitsika, & Patel, 2009). Literature mentioned that menstrual cycle should be assessed as a vital sign; cycle characteristics outside of given norms should prompt further assessment (Adams Hillard, 2014).

‘Symptoms and their impacts on daily activities’ involve assessment of menstruation-related symptoms and their impact on daily life. Many studies considered and measured followings as menstrual health: menstrual pain, menstrual symptom experiences, dysmenorrhea, symptoms of premenstrual syndrome, severity of a variety of somatic and psychological symptoms before and during menstruation, frequency of school absenteeism caused by menstrual symptoms, and levels of disturbances in daily life or school life (Cha & Sok, 2016; Chandra-Mouli & Patel, 2017; Jung & Kim, 2004; Kim et al., 2008; Parker et al., 2009; Sanfilippo & Erb, 2008; Taghizadeh, Shirmohammadi, Feizi, & Arbabi, 2013; van Iersel, Kiesner, Pastore, & Scholte, 2016). Research has shown that menstrual health status is reflected in the levels of disturbances in daily life or school life in adolescents (Agarwal & Venkat, 2009; van Iersel et al., 2016).

‘Self-care managing behaviors’ involve assessment of menstrual health care behaviors, menstrual hygiene, and self-care behaviors for discomfort relief. To assess menstrual health in adolescents, studies have measured following specific activities for managing their own menstruation: hygiene habits during menstruation, dietary habits to

relieve menstrual symptoms, behaviors adopted in daily life to prevent dysmenorrhea, and self-managing strategies when the symptoms occur (Fakhri, Hamzehgardeshi, Golchin, & Komili, 2012; Liu, Chen, & Peng, 2012; Secor-Turner, Schmitz, & Benson, 2016; Su & Lindell, 2016; van Iersel et al., 2016). Researchers have included self-care behaviors and practices for menstruation or menstrual symptom relief during menstrual health education (Chiou, Wang, & Yang, 2007; Djalalinia et al., 2012). Also, literature mentioned that for understanding menstrual health among adolescents, health care providers need to know what practices or coping behaviors they develop for managing menstrual symptoms and their impact (Chandra-Mouli & Patel, 2017).

‘Attitudes and perceptions on menstruation’ involve assessment of attitudes about menstruation and perceptions on it. Parker et al. (2009) included items of perceptions and attitudes towards various aspects of menstruation in their menstrual disorder questionnaire. For assessing menstrual health, researchers attempted or suggested to measure menstrual attitudes, confidence in performing menstrual health care behaviors, emotional feelings about menstruation, and perceptions about menstruation (Ali & Rizvi, 2010; Chandra-Mouli & Patel, 2017; Su & Lindell, 2016). Attitudes towards menstruation and perceptions about it have been measured as an effect indicator of menstrual health education, and also explored in qualitative studies for further understanding of menstrual health in adolescents (Chiou et al., 2007; Liu et al., 2012; Orringer & Gahagan, 2010; Secor-Turner et al., 2016).

The WHO definition of health describes health as “a state of complete physical, mental, and social well-being and not merely the absence of

disease or infirmity.” Huber and his colleagues (2011) defined health as “the ability to adapt and self-manage in the face of social, physical, and emotional challenges”, and suggested to measure the individual’s capacity to cope and to adapt, or to measure the strength of a person’s physiological resilience. Considering these definitions of health and the results of the literature review, in this study, we would define menstrual health as a state of well-being in which women have a healthy cycle, are able to manage their menstruation-related symptoms, and can live their life without interference from the symptoms, which leads to healthy perception on and attitudes towards their own menstruation.

Phase 2: Item Generation

Methods. An item pool and a draft questionnaire were developed in phase 2. According to the retrieved constructs of the concept from the phase 1, two of the authors developed an item pool using the half of the literature respectively, and then all three authors reduced the initial item pool with further discussion. The reduced item pool was confirmed by an expert panel.

Results. A 92-item pool to assess menstrual health in adolescents was developed with items covering four main components described above. According to the guideline of DeVellis (2012), even the two item versions differing by only a single word were included in initial item pool. The initial item pool was reduced by all three authors’ discussion; 5 items that were inappropriate for adolescents (e.g., “I wash the perineal area during my period”: culturally unacceptable item for young students; “I can change pads appropriately”: too subjective and for elementary students) and 41 redundant items were deleted. Then, an expert review panel (2 nursing professors and 1 school nurse)

assessed the suitability of the reduced item pool; two items were deleted additionally due to redundant meaning. Finally, 44 items were selected for the draft scale: 5 items on cycle characteristics, 22 items for symptoms and their impact on daily activities, 9 items on self-care managing behaviors, and 8 items on attitudes and perceptions on menstruation.

Phase 3: Evaluation of Content Validity and Face Validity

Methods. In phase 3, the 44-item instrument was assessed for content validity and face validity. Content validity was evaluated by the content validity index (CVI). Seven experts (4 nursing professors teaching women's health and child health nursing, 2 school nurses, and 1 physician of gynecology) were asked to rate each item of the preliminary MHI in terms of its relevance to the underlying construct from 1 (irrelevant) to 4 (highly relevant). Two types of CVIs were computed: the content validity of individual items and that of the overall scale (Polit & Beck, 2006). The item-level CVI (I-CVI) was computed as the number of experts giving a rating of either 3 or 4 divided by the total number of experts. The scale-level CVI (S-CVI) was calculated by dividing the number of items rated 3 or 4 by the total number of items (Polit & Beck, 2006).

To evaluate face validity, the scale was administered to a convenience sample ($n = 3$) of adolescents. They were asked whether any items were ambiguous or difficult to answer.

Results. The I-CVI ranged from .71 to 1.00. Two of the items ("If possible, I want cessation of menstruation", "Women need to accept menstruation and endure menstrual symptoms") were scored .71 which is below the recommended value of .78 (Polit & Beck, 2006) and thus were eliminated, leaving 42

items. The S-CVI of the remaining 42-item MHI was .90, which indicated that content validity of the MHI was acceptable (Polit & Beck, 2006).

Regarding face validity, adolescents reported some items were confusing, thus, items that were unclear or ambiguous were revised and items that were too long were shortened. For instance, the item "I have physical symptoms of painful breasts, bloating, and swelling of hands or foot before my period" was revised into "I have physical symptoms before my period (e.g., swelling of hands and foot, painful breasts, bloating)" because one of the adolescents who experienced symptoms other than the listed reported confusion. Time to complete the questionnaire was 10–13 minutes. Through the CVI and the adolescents' feedback, 42 items were selected for inclusion in the MHI for further testing of psychometric properties.

Phase 4: Psychometric Testing

Study design. In phase 4, reliability and validity of the instrument were evaluated. For psychometric evaluation of the 42-item MHI, a cross-sectional descriptive design was used.

Setting and sample. Participants were recruited from one middle school and two high schools in Seoul, Korea by a trained research assistant. Eligibility criteria included: (1) students who were in middle schools or high schools, (2) students whose time since menarche was more than 12 months, (3) not being pregnant, and (4) female adolescents who can read and understand Korean. A convenient sample of 230 students was recruited and all of which participated in the study. The sample size of 230 exceeded the recommended minimum of five participants per item for a factor analysis ($5 \text{ participants} \times 42 \text{ item} = 210$; Tabachnick & Fidell, 2001).

Data collection and procedure. Data were collected

using a self-report questionnaire during June to July 2015. After obtaining permission from the schools, a trained research assistant explained the study and eligibility criteria to students during break times at several classes in each school. Students who wanted to participate in the study visited school health rooms, where the research assistant informed the students about the study. The students who were informed about the study took the questionnaires home and showed it to their parents for approval by signing a consent form. The parents were given an explanation of the proposed research procedures in an accompanying leaflet. The research assistant collected data from only students who returned both the signed informed assent form and the parental consent form.

Ethical considerations. The study was approved by the Institutional Review Board and ethics committee of the researchers' institutions (IRB 15-66-A-1). All participants and their parents were informed about the study and given information about the right to withdraw from the study without any penalties. All participants and their parents agreed to participate in the study and signed the assent form.

Instruments. In addition to the 42-item MHI, participants were asked to answer two other instruments.

The MHI. The MHI, a self-rated questionnaire, was developed by the authors. The respondents were asked to answer regarding their menstruation during the past three months. It is 4-point Likert-type scale (*1=not at all, 4=extremely*), and higher scores indicate better menstrual health status. The scale contains items that need to be reverse-scored (items of symptoms and their impact on daily activities). Scale scores were calculated as the sum of the item scores.

Health-related quality of life (HRQOL).

Students' HRQOL was measured by the Pediatric Quality of Life Inventory Version 4.0 Generic Core Scale (PedsQL 4.0) developed by Varni et al. (2001). In the current study, Choi's (2005) Korean version (self-report format) was used. It consists of four components: physical functioning, emotional functioning, social functioning, and school functioning. It is a 5-point response scale (*0=never a problem, 4=almost always a problem*). Items are reverse-scored and transformed to a 0 to 100 scale (*0=100, 1=75, 2=50, 3=25, 4=0*). Scale scores were calculated as the sum of the items divided by the number of items answered. Higher scores indicate better HRQOL. Cronbach's alpha coefficient was .93 when it was translated into Korean and applied to general Korean adolescents (Choi, 2005) and was .92 in the present study. It showed significant positive correlations with several other quality of life (QOL) scales when it was translated into Korean (Choi, 2005).

Menstrual symptoms. Menstrual symptoms were measured by Menstrual Symptom Questionnaire (MSQ; Chung, 1999) consisting of 30 items (5-point Likert-type) assessing severity of the menstrual symptoms. Higher scores indicate more severe menstrual symptoms. Cronbach's alpha coefficient was .92~.95 when it was used for Korean high school students (Chung, 1999; Shin, 2013) and was .96 in the current study. It has adequate validity in that it was sensitive or responsive to changes following an intervention (Shin, 2013).

Data analysis. Data were analyzed using SPSS version 21.0 for Windows. For testing psychometric properties of the MHI, four steps were involved. The first step was an item analysis. For item analysis, item-total correlation analyses were conducted ($.20 < \text{recommended value} < .80$; Everitt & Skrondal, 2010).

The second step was an initial exploratory factor analysis (EFA). We performed EFA to identify latent constructs and the underlying structure of the scale. Principal component method with an oblique rotation was used because the factors of the MHI were interrelated. Third, validity of the shortened final scale was evaluated through three approaches: (a) construct validity (second EFA), (b) known-groups validity, and (c) criterion-related validity. Finally, in the fourth step, we evaluated reliability through two approaches: (a) internal consistency reliability, and (b) test-retest reliability. We employed the intraclass correlation coefficients (ICC) to measure test-retest reliability (>.75 excellent, .40-.75 fair to good, <.40 poor; Fleiss,

1986).

Results. A total of 230 adolescent girls participated in the study. No one refused to respond to the questionnaire and the participation rate was 100%. The mean age of the participants was 16.85 years (SD=1.79, range: 14-19 years). About half of the participants (45.7%) were middle school students. The mean body mass index for the participants was 20.58 (SD=2.56, range: 15.40-29.69). The mean age at menarche was 13.25 years (SD=1.15, range: 11-16 years). About one tenth of the participants (10.4%) had visited clinics for menstrual problems. The mean menstrual cycle length was 32.88 days (SD=13.44). Average duration of menstruation was 6.36 days

Table 1. Characteristics of the participants ($N = 230$).

Variables	N	%	Mean	SD
Age (years)			16.85	1.79
School level				
Middle school student	105	45.7		
High school student	125	54.3		
BMI			20.58	2.56
Underweight (BMI < 18.5)	47	20.4		
Normal (18.5 ≤ BMI < 23)	143	62.2		
Overweight (23 ≤ BMI < 25)	20	8.7		
Obesity (BMI ≥ 25)	13	5.7		
No response	7	3.0		
Age at menarche			13.25	1.15
Visited clinics (for menstrual problems)				
Yes	24	10.4		
No	206	89.6		
Menstrual cycle length			32.88	13.44
Cycle length < 21	9	3.9		
21 ≤ cycle length < 45	180	78.3		
Cycle length ≥ 45	23	10.0		
No response	18	7.8		
Duration of menstruation			6.36	1.63
Menstrual pain intensity [†]			4.00	2.88
Score 0-3	110	47.8		
Score 4-6	64	27.8		
Score 7-10	56	24.4		

Note: BMI: body mass index.

[†]0-10 numerical scale.

(SD=1.63, range: 3–20 days). Average menstrual pain intensity was 4.00 on 1–10 numerical scale (SD=2.88). Demographic and menstrual characteristics of the participants are presented in Table 1.

Item analysis. We used corrected item–total correlations to examine the extent to which any one of the items under consideration was correlated with the total score of the participants. The item–total correlation coefficients of the 42 items ranged from $-.19$ to $.75$. Ten items had corrected item–total correlations that were either negative or less than $.20$ (e.g., “I feel menstruation is not clean and disgusting”, “I took medicine to relieve menstrual symptoms”, “I used hot packs for relieving menstrual discomfort”); thus, they were excluded, leaving a set of 32 items for initial factor analysis. Although literature said pain managing behaviors or coping is meaningful for assessing menstrual health, some of the items dealing with coping behaviors when pain comes resulted in negative correlations with the total score. It seems that adolescents with no symptoms might answer on “not at all”. However, the items dealing with daily habits for reducing menstrual symptoms (e.g., “I usually keep my body warm”, “I have dietary habits of eating less salty and taking less caffeine”) showed significant positive correlations with the total score.

Initial exploratory factor analysis. Before assessing the construct validity using the EFA, we calculated the Kaiser–Meyer–Olkin (KMO) value to assess the suitability of the data for factor analysis. With the set of 32 items, the KMO value was $.89$, indicating the data set was acceptable for factor analysis. The Bartlett’s test for sphericity significant ($<.01$), supporting suitability of the data for factor analysis.

After performing EFA for the 32 items, six

factors with eigenvalues larger than 1 initially emerged. To perform data reduction and simplify data structure, we deleted one factor that consisted of only one item. Following Tabachnick and Fidell’s (2001) guidelines, we also excluded two items with factor loadings less than $.45$; thus, 29 items were retained.

Construct validity: Second exploratory factor analysis. To determine factor structure of the scale, we again performed EFA for a set of 29 items that remained in the initial factor analysis. The KMO value was $.92$ and the Bartlett’s test for sphericity was significant ($<.01$). The results of the EFA with the final set of 29 items are presented in Table 2. Five factors were extracted: (1) affective symptoms, (2) somatic symptoms and school life, (3) daily habits for menstrual health, (4) menstrual cycle characteristics, and (5) attitudes and perceptions on menstruation. The rotated factor matrix for the 5-factor solution accounted for 63.1% of the variance. Factor loading for all items was above the desired criterion of $.45$.

Known-groups validity. Known-groups validity is demonstrated when individuals that are known to be high (or low) on the construct being assessed score higher (or lower) on the measure of that construct than individuals known to be low (or high) on that construct (Wallston, 2005). In the current study, it was hypothesized that there would be significant differences in MHI scores between students who had visited clinics for menstrual problems and those who had not.

The MHI score differences between students who had visited clinics for menstrual problems and those who had not were examined using t -tests. The mean total and subscale scores of the MHI in the visit-clinics group were lower than those in the no visiting experience group (Table 3).

Table 2. Item loadings for the Menstrual Health Instrument.

Items	Factors				
	1	2	3	4	5
9. I feel everything bothersome and want to be alone before my period.	.87				
10. I feel anxious or depressed before my period.	.85				
8. I feel irritable or annoyed before my period.	.85				
11. I become sensitive before my period.	.81				
13. I sleep too much or have trouble falling asleep before my period.	.76				
15. I feel tired or weak before my period.	.76				
21. I have mood swings during my period.	.75				
16. Before my period, I am not in control of my emotions and feel overwhelmed.	.75				
12. I have poor concentration before my period.	.74				
14. I have changes in appetite before my period.	.68				
22. I have difficulty concentrating during my period.	.54				
20. I have headaches during my period.	.53				
4. Menstrual symptoms interfere with my classroom activities.		.85			
3. I have severe cramping during my period.		.84			
5. I have difficulty in out-of-classroom activities due to my menstrual symptoms.		.79			
18. I have low abdominal pain or discomfort during my period.		.75			
6. Sometimes, due to menstrual symptoms, I am tardy or absent from school, or come home before school is out.		.66			
27. My body conditions during menstruation are not very different from usual conditions.		.63			
7. Menstrual cramping is more painful under stressful situations such as tests or exam.		.61			
19. I have backache during my period.		.55			
17. I have physical symptoms before my period (e.g., swelling of hands or foot, painful breasts, and bloating)		.46			
24. I have dietary habits of eating less salty food and taking less caffeine.			.83		
25. I enjoy wearing clothes which are air permeable instead of tight pants.			.75		
23. I usually keep my body warm.			.70		
1. My menstrual cycle is regular.				.82	
2. The length of my menstrual cycle is between 21 and 45 days.				.76	
28. I have healthy menstrual cycles and periods.				.58	
29. Menstruation is a natural phenomenon, which is integral to body functions in women.					.86
26. I think menstruation is an important indicator of women's overall health.					.76
Eigenvalue	10.53	2.50	2.22	1.64	1.41
Variance explained (%)	36.31	8.63	7.65	5.65	4.85

Note: Factor 1: affective symptoms; Factor 2: somatic symptoms and school life; Factor 3: daily habits for menstrual health; Factor 4: menstrual cycle characteristics; Factor 5: attitudes and perceptions on menstruation.

Table 3. Comparison of the MHI scores between visit-clinics group and no visit-clinics group.

Scales and subscales	Visit-clinics group (N = 25)		No visit-clinics group(N = 214)		Mean difference	t statistic
	Mean	SD	Mean	SD		
Total MHI score	67.48	11.62	79.96	15.07	12.48	-4.32**
Factor 1	27.17	6.83	32.89	9.26	5.72	-4.12
Factor 2	19.93	6.56	24.79	5.92	4.86	-4.15**++
Factor 3	6.76	1.75	7.12	1.64	0.36	-1.12
Factor 4	7.31	1.61	8.62	1.86	1.31	-3.64**
Factor 5	6.31	1.04	6.42	1.08	0.11	-0.52

Note: MHI: Menstrual Health Instrument.

** $p < .01$.

++Equal variances not assumed.

However, differences in scores for factors 3 and 5 between the two groups were not significant.

Criterion-related validity: The criterion-related validity was evaluated through the examination of relationships between the MHI and relevant measures. In the current study, it was hypothesized that the MHI scores would be significantly correlated with menstrual symptoms and HRQOL (Iacovides, Avidon, Bentley, & Baker, 2014; Karlsson, Marions, & Edlund, 2014), measured by the MSQ and the PedsQL, respectively. HRQOL is intrinsically tied to one's sense of a positive health status and measures health perception (Dugger, 2010; Sajid, Tonsi, & Baig, 2008; Sitoh et al., 2005; Wilson & Cleary, 1995; Wodchis, Hirdes, & Feeny, 2003). Furthermore, the PedsQL measures HRQOL in physical, psychological, social, and school life aspects, which was hypothesized to

have relationships with the MHI that measures menstrual health in aspects of physical, emotional, social, and school life.

The MHI showed significant positive correlations with the PedsQL and significant negative relationships with MSQ (Table 4).

Reliability. Cronbach's alpha coefficients of the total score and the subscale scores for the MHI ranged from .62 to .94. Factors 4 and 5 had the lowest alpha of .62 and .64, respectively, but contained only 2 or 3 items. Given the large effect of the number of items on the Cronbach's alpha coefficients, we judged the relatively low value as an acceptable level of internal consistency (Jansson et al., 2014; Streiner & Norman, 2008).

The test-retest correlations during a three-week period were also good. The test-retest

Table 4. Correlations between the MHI and relevant measures.

	MHI total	Factor 1	Factor 2	Factor 3	Factor4	Factor5
PedsQL	.48**	.48**	.42**	.17**	.25**	.27**
MSQ	-.80**	-.75**	-.77**	-.22**	-.04	-.03

Note: MHI: Menstrual Health Instrument; PedsQL: Pediatric Quality of Life Inventory; MSQ: Menstrual Symptom Questionnaire.

** $p < .01$ (two-tailed).

Table 5. Descriptive statistics and reliability coefficients for the MHI.

Scales	Number of items	Mean	SD	Item mean	SD	Cronbach's alpha	Test-retest correlations
MHI total	29	80.49	14.24	2.78	0.49	.91	.83**
Factor 1	12	33.32	9.39	2.78	0.78	.94	.78**
Factor 2	9	25.04	6.36	2.78	0.71	.90	.88**
Factor 3	3	6.80	1.98	2.27	0.66	.70	.70**
Factor 4	3	8.56	1.68	2.85	0.56	.62	.75**
Factor 5	2	6.77	1.00	3.38	0.50	.64	.46**

Note: MHI: Menstrual Health Instrument.

** $p < .01$ (two-tailed).

correlation coefficients of the MHI were all significant and ranged from .46 to .88. The results of reliability tests and descriptive statistics are presented in Table 5.

Discussion

This study describes the development of the MHI and initial psychometric properties to measure menstrual health for adolescent girls. We performed a rigorous process for developing and evaluating the psychometric properties of the measure: content validity and face validity, item validity, construct validity, known-groups validity, criterion-related validity, and reliability. The results showed a potential utility of the MHI in research related to menstrual health in adolescent groups.

Content validity was enhanced by the literature. The MHI items were developed from the results of extensive literature review of 62 papers. It was also evaluated by the expert panel who expected to teach about menstrual health in schools or to provide care for menstrual health in adolescent girls. They rated the items as highly relevant in capturing the components of adolescents' menstrual health, supporting the suitability of the item contents of the MHI. This suggests that health care providers who use data from the MHI can be confident that

variances in obtained scores are due to menstrual health (Gau & Hung, 2014). The scale items were also refined by the adolescents' feedback on the understandability of the scale, suggesting acceptable face validity.

Psychometric testing of the item analysis and iterative factor analysis resulted in a relatively short, internally consistent measure of menstrual health in adolescents. Findings showed that the MHI is a multidimensional scale comprising five factors. These five factors showed a logical connection to the theoretical framework (four components retrieved from the literature) used for the design of the instrument and explained 63.1% of the variance in menstrual health.

Factors 1 and 2 concerned symptoms before and during menstruation. Factor 1 is related to affective symptoms such as a feeling of lassitude, anxiety, mood swing, sensitiveness, and feelings of overwhelmed. Items that loaded high in factor 2 focused on somatic symptoms (e.g., menstrual cramps, low abdominal pain, and backache) and the school life such as class participation and school absences. Symptom impact on daily activities is an important outcome measure of the menstruation-related symptoms in adolescents (Houston et al., 2006).

Results of the current study showed that disturbances in school activities might be more related to somatic symptoms than affective symptoms. Previous studies and literature have also revealed that pain during menstruation is the leading cause of poor academic performance, limitation in sports activities, and recurrent school absenteeism (Nur Azurah et al., 2013; Sanfilippo & Erb, 2008). However, based on correlation analysis with relevant measures in the current study, affective menstrual symptoms seem to be more related to adolescents' HRQOL than somatic symptoms did. Previous literature stated that even though the most common menstruation-related symptoms which decrease quality of life are categorized as pain, these physical complaints are related to affective symptoms in many cases (Taghizadeh et al., 2013). Other research also suggests that pain symptoms reduce opportunities to engage in daily activities and developmental activities, including school and sports and spending time with friends, which may then lead to chronic negative psychological outcomes and decrease in HRQOL (van Iersel et al., 2016).

Factor 3 items are related to daily habits for menstrual health. It includes the items concerning sodium and caffeine intake and keeping the body warm. Several previous studies reported strong correlations between caffeine/cafeinated beverage intake and premenstrual symptoms (Chayachinda, Rattanachaiyanont, Phattharayuttawat, & Kooptiwoot, 2008; Pinar, Colak, & Oksuz, 2011; Rossignol, Bonnlander, Song, & Philis, 1991). Salt can be another aggravating factor for menstrual cramping; thus, decreasing salty food intake to alleviate menstrual symptoms has been recommended (Hudson, 2007). Indeed, many women avoid foods high in salt and caffeine for alleviating menstrual symptoms (Chiou et

al., 2013; Hamaideh, Al-Ashram, & Al-Modallal, 2014). Furthermore, especially in Asia, it is known that keeping the body warm (e.g., using heating pad, wearing warm clothes, drinking hot water, avoiding cold beverages) is beneficial for decreasing menstrual discomfort (Cha & Sok, 2016; Chiou et al., 2013; Hamaideh et al., 2014). The current study found that these daily habits were significantly correlated with HRQOL and menstrual symptom severity in adolescents, and accounted for 7.65 % of the variance in menstrual health. Menstruation, as a monthly experience, is a part of life experience for women, and daily healthy habits undoubtedly help them maintain menstrual health (Chiou & Wang, 2008; Chiou et al., 2013).

Items that loaded high with factor 4 concerned menstrual cycle characteristics. It contained three items on menstrual regularity, length of cycle, and self-evaluations of one's own menstruation. The current study showed that factor 4 was significantly correlated with HRQOL while it showed no relationship with the menstrual symptom score. This may mean that menstrual regularity and cycles are not closely associated with symptom severity but still may influence individual perceptions of menstrual health and finally affect HRQOL which is intrinsically tied to one's sense of a health status (Dugger, 2010; Sajid et al., 2008; Sitoh et al., 2005; Wilson & Cleary, 1995; Wodchis et al., 2003). Previous studies have indicated that although menstrual cycles might be often irregular through adolescence (American Academy of Pediatrics & American College of Obstetricians and Gynecologists, 2006), adolescents need to attend to the regularity of their menstrual cycles (Adams Hillard, 2014; American Academy of Pediatrics & American College of Obstetricians and

Gynecologists, 2006). Literature mentioned that 90% of cycles were within the range of 21 to 45 days even in the first year after menarche that cycles may be somewhat longer because of anovulation (American Academy of Pediatrics & American College of Obstetricians and Gynecologists, 2006). Cycle irregularity outside of given norms should prompt further assessment to determine the underlying cause (e.g., hormone imbalance, primary ovarian insufficiency, or eating disorder; Adams Hillard, 2014). Thus, cycle regularity and length should be assessed as a vital sign to evaluate menstrual health in girls and adolescents (American Academy of Pediatrics & American College of Obstetricians and Gynecologists, 2006; Nelson, 2010).

Factor 5 items concerned attitudes and perceptions on menstruation. Although factor 5 contained unacceptably few items and indicated poor internal consistency, these items are important in their specificity to the scale that measures menstrual health. Menstruation has often been treated from a pathological point of view, focusing on premenstrual syndrome or dysmenorrhea (McPherson & Korfine, 2004). How women feel about or perceive their menstruation has been considered less under the overall issue of menstrual health (McPherson & Korfine, 2004; Morrison et al., 2010). However, adolescents who have poor perceptions about menstruation have reported higher morbidity associated with menstruation (Houston et al., 2006). Women who have negative menstrual experiences are less likely to feel their menstruation as natural than the positive group (McPherson & Korfine, 2004). In the current study, however, factor 5 was not correlated with menstrual symptom severity; it may be caused by the items in factor 5 that measured perceptions about

general menstruation not about their own menstruation. In the further revision and psychometric testing, there may be a need to consider adding or changing to the items of perceptions on her menstruation. As expected (Wong, 2011), factor 5 is significantly correlated with HRQOL. Adolescent girls having more positive attitudes towards menstruation had better HRQOL.

The results of the known-groups technique supported the discriminating property of the instrument. The scores of the students who had visited clinics for menstrual problems were lower than the scores of those who had not visited clinics for all five factors. However, the score differences in daily habits for menstrual health and attitudes towards menstruation were rather small and not significant. Possibly, those with experiences of visiting clinics tried to have healthy habits to relieve menstrual symptoms; furthermore, the number of items measuring those two factors was relatively small.

Limitations

The study findings should be considered in the context of the following limitations. First, participants were not representative of the population sampled. The study is limited by its focus on a sample from only three schools. Also, the study did not include adolescents who did not attend the school. Future studies should survey a broader range of adolescents in the community setting. Secondly, although we evaluated known-groups validity by comparing groups who had visited clinics for menstrual problems with those who had not, additional validity assessment (such as predictive validity) to test how sensitive the measure is to detecting changes in outcome following an intervention or treatment should be undertaken in future research.

Conclusion

The MHI is a comprehensive measure of menstrual health in adolescents, with five unique subscales, each of which captures a meaningful aspect of menstrual health. The reliability and validity estimates showed the potential for use of the MHI for screening in school or community settings. Health care providers in school settings or primary care settings might use the scale to gather information about adolescents' menstrual health status to identify those with particularly low scores on the scale. Low scores might be a starting point for intervention that focuses on lifestyle modification and symptom management. The MHI also has potential for research; it could be used to determine how adolescents are responding to intervention in clinical trials. In future studies, the MHI may be used to predict morbidity in adolescents with menstrual problems. However, further studies should be undertaken to improve generalizability and to provide further evidence on the psychometric validity of the MHI (e.g., confirmatory factor analysis, predictive validity, determination of cut-off scores). Extensive validation of the MHI in diverse cultural contexts and settings would be helpful for cross-cultural use and comparison of the results and for identification of appropriate interventions.

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Development and psychometric validation of the Menstrual Health Instrument (MHI) for adolescents in Korea

Hyunjeong Shin¹ · Young-Joo Park² · Inhae Cho³

Hyunjeong Shin¹, PhD, RN, Professor, College of Nursing, Korea University

Young-Joo Park², PhD, RN, Professor, College of Nursing, Korea University

Inhae Cho³, MSN, RN, PhD candidate, College of Nursing, Korea University

Abstract: The aims of the researchers were to develop and test initial psychometric properties of the Menstrual Health Instrument, a measure of menstrual health in adolescents that comprehensively evaluates menstrual health. Data were collected with a convenience sample of 230 Korean adolescent girls. As a result of exploratory factor analysis with the 29-item instrument, five factors were extracted: affective symptoms, somatic symptoms and school life, daily habits for menstrual health, menstrual cycle characteristics, and attitudes and perceptions on menstruation. The reliability and validity estimates indicate the Menstrual Health Instrument could be used for screening in school or community settings.

Keywords: _menstrual health, instrument development and validation, adolescence

* Address reprint requests to : Inhae Cho

College of Nursing, Korea University, 145 Anam-ro, Seongbuk-gu, Seoul 02841, South Korea.

E-mail: inhae05@gmail.com

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발행처 : 고려대학교 간호학연구소

서울시 성북구 안암로 145 (02841)

Tel: 02-3290-4751, Fax: 02-928-9108

E-mail: nursing_research@korea.ac.kr

발행인 : 서 문 경 애
